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ACORN USER

AUGUST 1985



MICRO PHONE-IN

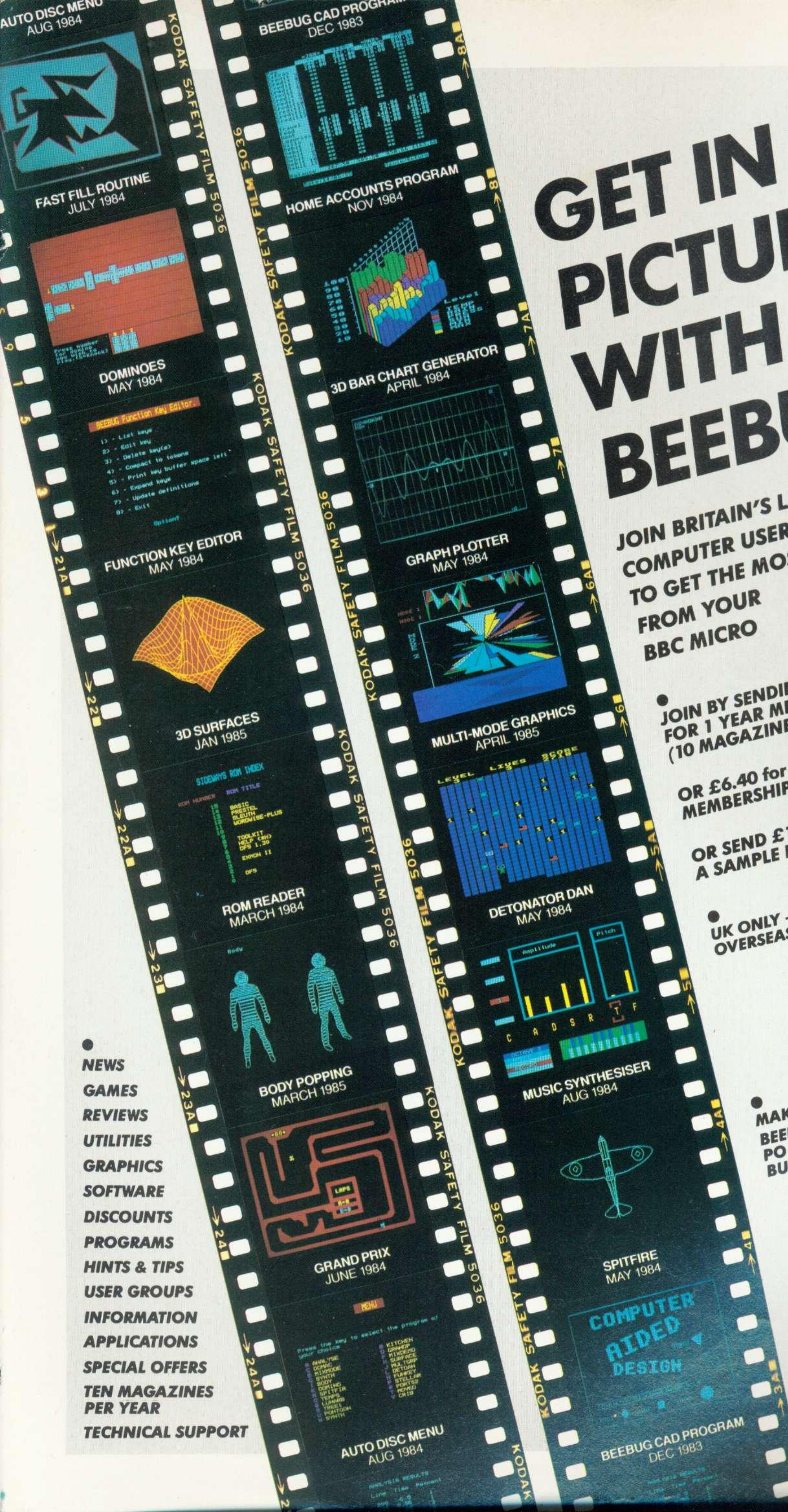
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GRAND PRIX JUNE 1984
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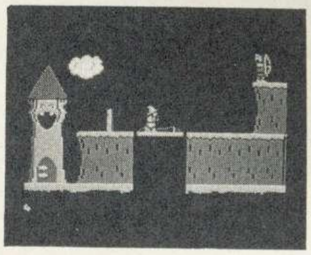
NEW USERS

ATOM

YELLOW PAGES

The major listings for this issue are printed in the yellow section starting on page 97. These are also available on cassette (which includes a tape-to-disc transfer routine and index program) and in bar code format to save you typing them in. Details of how to order these on pages 96 and 110

REVIEWS



REGULARS

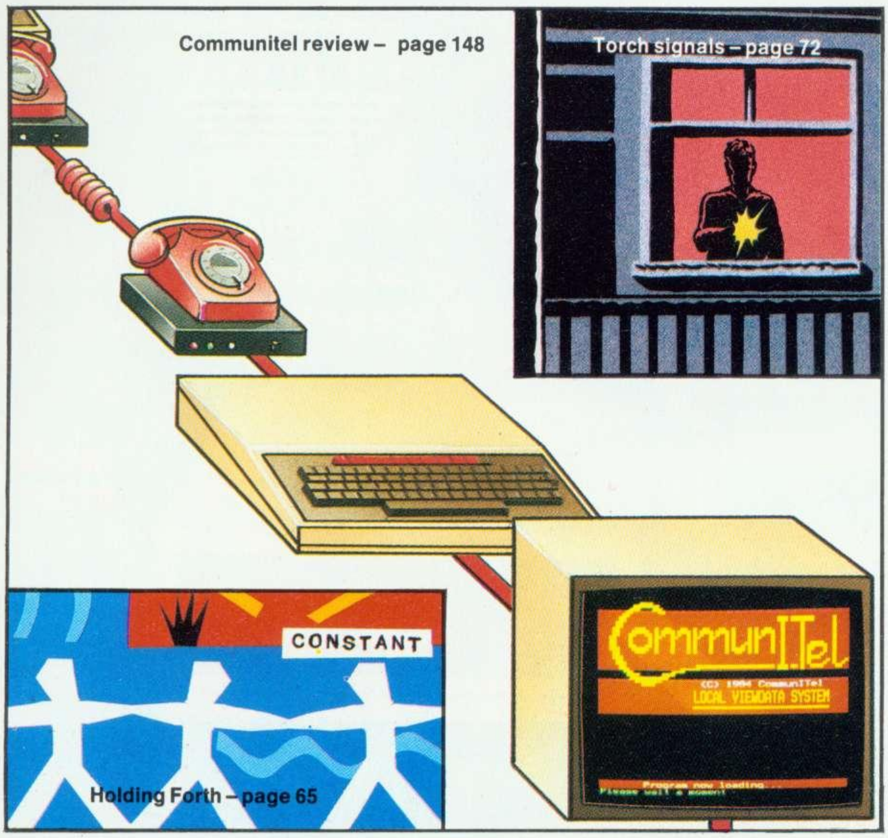
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COMMUNICATIONS SPECIAL AUGUST



BUSINESS



Acorn User
August 1985
Issue number 37

Cover illustration by
Rosemary Harrison

NEXT MONTH

GAMES AND WORDPROCESSORS

Still waters run deep
Look out for the submarine game *Run Silent, Run Deep* – we present the listing for you to enter

View made transparent

Wordwise and View
How to write programs using these wordprocessors

Wordprocessor hints and tips

Easyplot thickens
Martin Phillips presents the second part of his graphics series

Secrets of running ROMs on the second processor

ROM boards examined and reviewed

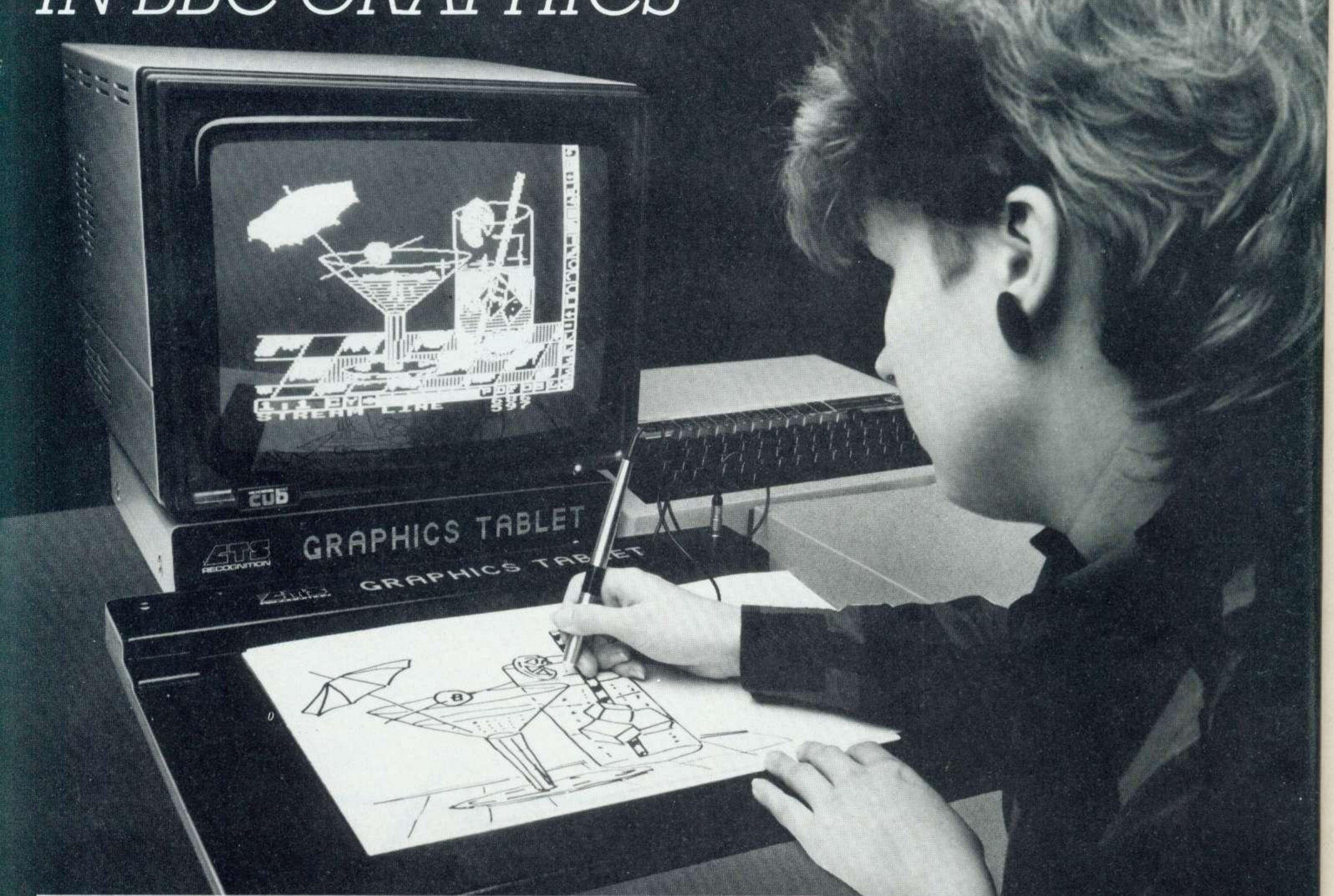
Playing the game
You can run games under CP/M – with our help

Notes for authors

Acorn User welcomes submissions from readers. Articles should be typed, double-spaced text with diagrams and screen dumps on separate sheets, or on disc in *Wordwise* (saved as a *SPOOL file using option 8) or *View* format. Leave large margins to allow space for editing.
Please enclose all programs on disc or cassette, with listings if possible. Also follow the style used in presenting listings in the yellow pages section. Photos should be 35mm, or larger, transparencies, or 5in by 7in black and white prints. Ensure your name is on everything, and keep a copy. Enclose a suitable stamped, addressed envelope if the submission is to be returned. Attach a short letter with the article giving its title with a daytime phone number if possible. Address your article to the Technical editor. Articles are acknowledged on receipt, but not submissions for the regular columns, letters pages and competitions. Please limit telephone enquiries to the Technical editor to Wednesday and Thursday afternoons.

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News in brief

☐WATFORD Electronics has three hardware products set for release: a sophisticated modem; Delta card to speed up the BBC micro and add 48k RAM, and a real-time clock with battery back-up.

These follow five software titles: *Romspell*, a spelling checker chip for *View* and *Wordwise* at £28.75; *Romas*, an assembler development ROM (£51.75); *Transferom* to shift tape-based programs to disc (£25.30); a diagnostics disc to test the BBC micro's hardware (£17.25); and *Colour Art* which adds colour patterns with 255 shades to the AMX Mouse (£14.95 on disc).

☐GLENTOP Publishers has a 3D Graphics Development System for the BBC. It costs £25 on disc and works with the 6502 second processor.

It allows rotation of wire-frame, 3D shapes, scaling and transformation. Animation is also possible. Glentop Publishers, Standfast House, Bath Place, High Street, Barnet, London EN5 1ED.

☐CROSSWARE Products has a set of cross-assemblers for the BBC micro. Each generates object code for a specific processor on the Beeb which will run on second processors or other computers.

The processor families supported are 6800, 6805, 6809, Z80, 8080 and the 16-bit 68000 processor. Prices are £55.20 for each 8-bit family or £64.40 for the 68000, on 40 or 80 track disc. Crossware Products, 2 The Lawns, Melbourn, Royston Herts SG8 6BA.

☐CLWYD Technics has released its *Edword 2* word-processor for schools, which is compatible with Acorn's DNFS and the 6502 second processor. Accents and better printing facilities are among the new features. Price is £45.95 to schools or £52.95 to others.

☐FEARLESS Software has produced a Basic tutorial course in monthly instalments. *Home Tutor* is available for the Beeb or Electron and each tape costs £10.95.

The series starts with an introductory tape, followed by twelve more which build up programming skills.

Fearless Software will be at the Acorn User Show or can be contacted on 01-980 5443.

Workstation puts power on desks

THE Cambridge Workstation is the first product from Acorn since the Olivetti rescue. The full version boasts a 32016 chip running at 8MHz with 4Mb of memory, Winchester hard disc, floppy drive and four bundled languages – Fortran 77, C, ISO Pascal and Lisp – BBC Basic and an assembler.

Its most astounding feature is the computing power it puts on a desk, giving the ability to run mainframe software and languages for £8000.

Acorn is negotiating with software companies and university groups to convert packages to run on the Workstation. These include the statistical package SPSS, the NAG library from Cambridge University, and Spice for circuit simulation.

The machine is being squarely targeted at the university sector and into industry. It comes in the ABC livery and is the only one of the business computer range to see daylight.

Benchmark timings confirm Acorn's claims for the product. The 32016 chip with its 32-bit architecture was designed as a mainframe on silicon. It runs software in similar times to a VAX minicomputer, and some even faster. Acorn also claims it is easy to transfer software from a mainframe, quoting just a day for one 15,000-line Fortran program.

Marketing manager Gwyn Matthews sees it selling purely on the ability to run software such as Spice. Acorn has been using the package and developed its own software to accompany it. Matthews hoped this would be marketed later in the year. The machine comes with built-in Econet



Cambridge Workstation offers mainframe power on a desk

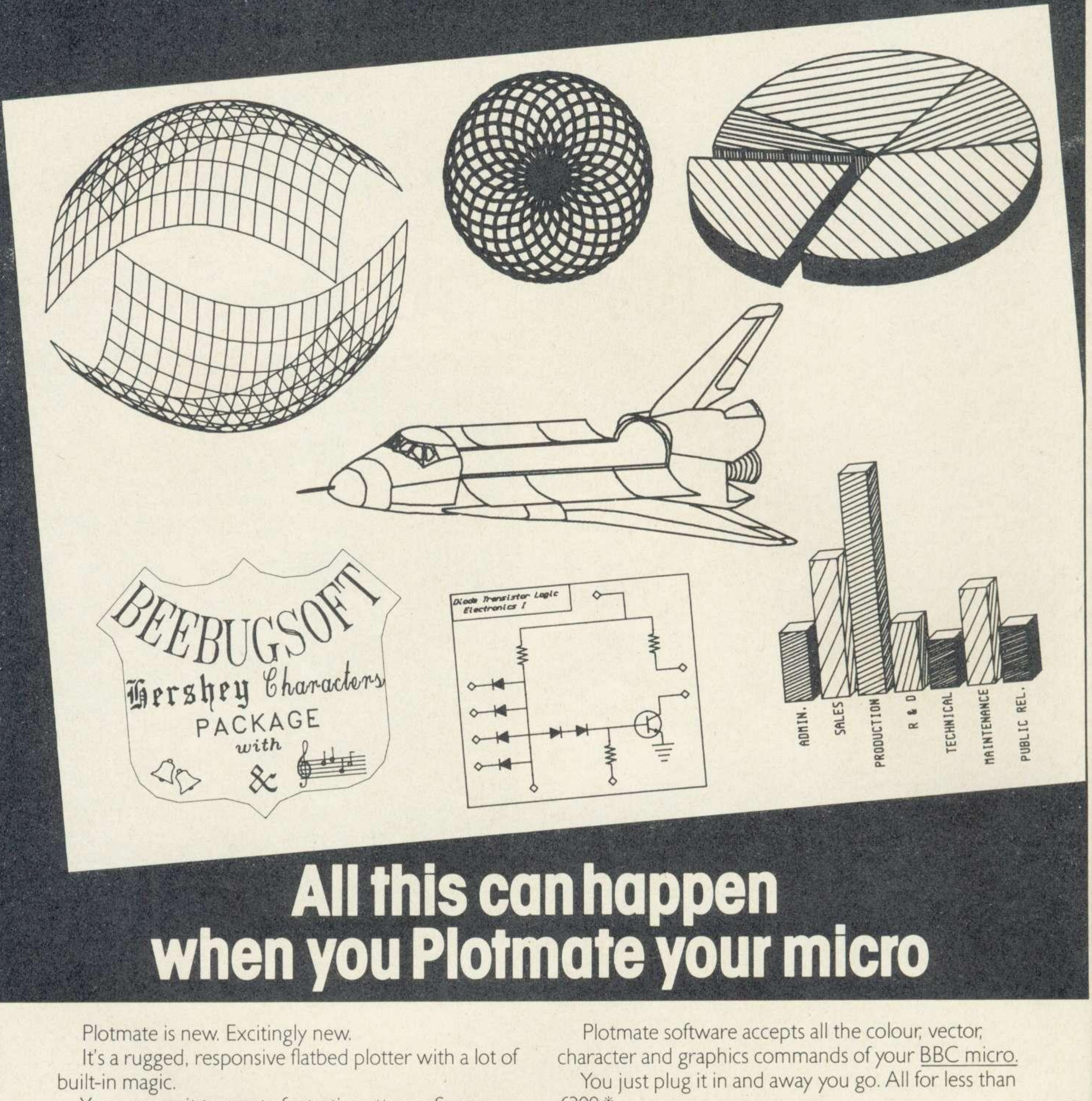
Turn to page 11

Acorn may sell off Acornsoft

OLIVETTI has made even more changes at Acorn, and laid off at least another 30 people. Several divisions not directly connected to computing look set for the chop – and even Acornsoft is up for grabs.

The consumer and education divisions are to be combined, the Acorn shop in London's Covent Garden closed, and shares in other companies sold off. Acorn Video could be sold – as well as Acornsoft.

Peter O'Keefe, director of the consumer division, left earlier in the year and since then two new men have been brought in by Olivetti – James Edwards from American giant AT&T, which owns a large share in Olivetti, and Alex Uboldi, an Olivetti director, as acting managing director.



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Plotmate is new. Excitingly new.

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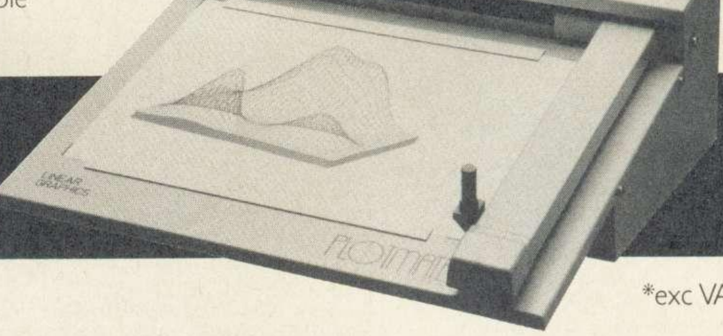
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Plotmate software accepts all the colour, vector, character and graphics commands of your BBC micro.

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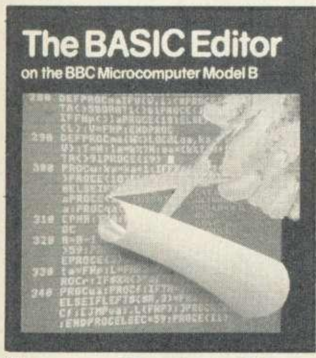


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Not-so Basic editor

ACORNSOFT's *Basic Editor* for the BBC micro is supplied in a 16k ROM with manual for £29.50. You edit and reformat your Basic programs in a wordprocessor style.

The *Editor* uses two screen modes. The first is a command screen through which general operations are performed, in a similar way to *View*. Direct program alterations are made on the edit screen, in any mode. Foreground and background colours can be used to create a personal display.

The four cursor keys control scrolling through the program. Like *View* and *Wordwise*, extra commands may be inserted into a line simply by positioning the cursor at the appropriate point and typing.

Function keys provide facilities to split and concatenate program lines. In addition, program lines can be deleted individually or in blocks using markers. In a similar way, chunks of lines may also be copied to another part of the program.

The GOTO and GOSUB specialists are catered for as the *Editor* allows use of labels for marking destination jumps.

Double your discs

DISC-DOUBLER is a cheap way of doubling the storage capacity of single-sided discs. It's a punch which cuts a 'write enable' slot on the reverse side of single-sided discs allowing both sides to be used, simply by flipping the disc over. It costs £5.69 from MGA Microsystems on (05806) 4278.

Word chip boost

BEEBUGSOFT has enhanced the *Wordwise Plus* wordprocessing chip with the release of a utilities disc. It adds more than a dozen extra features including faster editing and easier manipulation of *Wordwise Plus* segments.

The disc – price to be finalised – will be launched at the Acorn User Exhibition.

Aries board matches B+ memory

by Bruce Smith

ARIES Computers, designer of the B20 20k RAM board, is to release a 32k version, giving a BBC B the memory of the B+.

It plugs into the microprocessor socket, and can be configured in four different ways using a *FX command.

State A is the B+ lookalike system. It allows use of 20k of shadow memory devoted to the screen, and 12k for sideways RAM. Unlike the B+, however, the 12k can be used to house sideways ROM software, or as an extended operating system buffer for use with printers, etc.

In states B and C, 16k of RAM is used as shadow RAM. This allows full use of the low resolution modes and the BBC micro need only supply 4k of its own memory for hi-resolution modes. The advantage here is that a full 16k of memory is available for use as sideways RAM.

Finally, state D dispenses with shadow screen memory, freeing two 16k banks for sideways RAM.

To allow compatibility with B+ software, links allow the user to select whether the shadow RAM is active or not when the micro is switched on.

Several new commands have been added to the ROM supplied with the system, which can be plugged into the extra ROM socket supplied on the B32 board.

Aries has also left the door open for a B128 board. This could have a permanent 20k shadow memory and 12k sideways RAM. The remaining 96k would be used in various combinations, possibly forming a silicon disc filing system.

The B32 board can be seen at the Acorn User Exhibition, though it will not be available until late August. The price of the B32 is £92 including VAT.

Reader finds flaws in advertising on Micronet

by Geoff Nairn

WARNINGS about the use of Micronet have been sounded after an *Acorn User* reader uncovered a serious loophole affecting 'teleshopping' and electronic advertising.

Unscrupulous subscribers can offer goods for sale on Prestel pages, cash the cheques and then not deliver the goods. And the buyer has no comeback as there is no written proof of the transaction.

Although no such extreme cases have been reported, reader Keith Faulkner noticed this potential for fraud in his dealings with a component supplier advertising in Micronet's Swap Shop. He sent an electronic 'order' for EPROM chips to the supplier's Micronet mailbox number, and forwarded his cheque by post.

The chips duly arrived, but when he tried to exchange a faulty one the supplier refused, claiming he had never agreed to do this. However, Mr Faulkner had taken a printout of the original mail box correspondence which showed the supplier had indeed agreed to replace faulty components.

Mr Faulkner eventually got the chip changed – but without the printout it may not have been such a happy ending. And there is some doubt over whether a computer printout of mailbox correspondence





Screen dumps from Swap Shop with advertising conditions

would be accepted as legal evidence.

In fact the whole area of interactive computer services and the law seems shrouded in confusion. The Consumers' Association told *Acorn User* it could see nothing to stop an unscrupulous subscriber offering goods on Prestel, cashing the cheques and then disappearing.

Responsibility

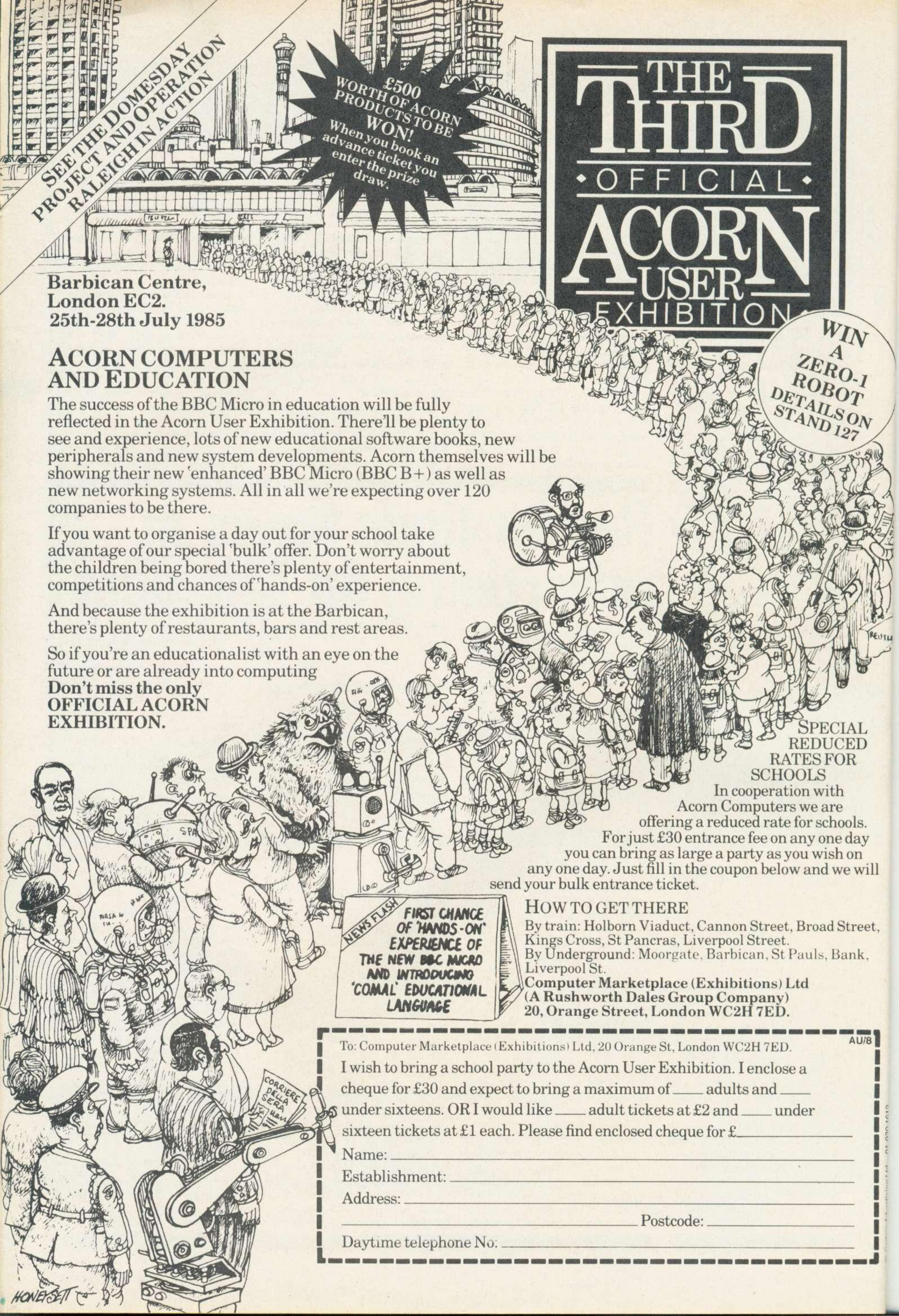
Prestel, however, insisted that all information providers offering teleshopping facilities comply with the Advertising Standards Authority guidelines. A Prestel spokesman added that Telemap, which owns Micronet, was ultimately responsible for goods offered on the Swap Shop and mailbox pages.

But Micronet had little idea of what was bought and sold on its pages. A spokeswoman said: 'We don't keep permanent records of the pages on Micronet and certainly not mailbox messages, which are for non-commercial users.

'We depend on users reporting any problems and as we have the names and addresses of every Micronet subscriber we can follow up any complaints.'

But if user identification numbers (IDs) and passwords are obtained illegally the genuine user could be in for a rough ride. For unlike credit card companies, Prestel and Micronet do not automatically indemnify genuine subscribers for fraudulent use of IDs. Micronet said: 'If a huge bill is run up on someone else's ID we wouldn't demand that bill be met, but obviously we have to look at each case.'

Prestel was less sympathetic: 'If passwords are written down and fall into the wrong hands then the user is negligent. 'If passwords are obtained by criminal means, as happened with the hackers earlier this year, then obviously that's a different matter.'



THE THIRD OFFICIAL ACORN USER EXHIBITION

Barbican Centre, London EC2. 25th-28th July 1985

ACORN COMPUTERS AND EDUCATION

The success of the BBC Micro in education will be fully reflected in the Acorn User Exhibition. There'll be plenty to see and experience, lots of new educational software books, new peripherals and new system developments. Acorn themselves will be showing their new 'enhanced' BBC Micro (BBC B+) as well as new networking systems. All in all we're expecting over 120 companies to be there.

If you want to organise a day out for your school take advantage of our special 'bulk' offer. Don't worry about the children being bored there's plenty of entertainment, competitions and chances of 'hands-on' experience.

And because the exhibition is at the Barbican, there's plenty of restaurants, bars and rest areas.

So if you're an educationalist with an eye on the future or are already into computing **Don't miss the only OFFICIAL ACORN EXHIBITION.**

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In cooperation with Acorn Computers we are offering a reduced rate for schools. For just £30 entrance fee on any one day you can bring as large a party as you wish on any one day. Just fill in the coupon below and we will send your bulk entrance ticket.

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20, Orange Street, London WC2H 7ED.

To: Computer Marketplace (Exhibitions) Ltd, 20 Orange St, London WC2H 7ED. AU/8

I wish to bring a school party to the Acorn User Exhibition. I enclose a cheque for £30 and expect to bring a maximum of ____ adults and ____ under sixteens. OR I would like ____ adult tickets at £2 and ____ under sixteen tickets at £1 each. Please find enclosed cheque for £____

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Tea company bags cheap software

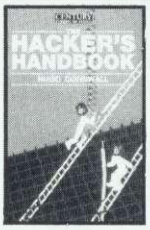
A BBC micro is up for grabs and all you have to do is drink tea! Twinings is offering a Beeb, complete with monitor and disc drive, and four runners-up prizes of Electrons in a simple competition, details of which can be found on any box of Twinings speciality tea bags.

Alongside the competition, Acornsoft is offering cheap BBC and Electron games titles. Collect two coupons per title – there's one on the side of each pack of Twinings tea bags – and you can get 30 per cent off 20 titles (cassettes only).

***Elite, Podd, Watch Your Weight, Crazy Tracer, Picture Maker, Go* and *Paul Daniels' Magic Show* are the titles on offer for Beeb and Electron.**

The other discounted BBC titles are *Tetrapod, Meteor Mission* and *Gateway to Koros.* The remaining Electron titles are *Snapper, Firebug* and *Sphinx Adventure.*

Hacker's book defies micro sales slump



by Geoff Nairn

BOOK publishers have been quick to blame a slump in the computer book market on falling hardware sales, but the best selling *Hacker's Handbook* and other well-produced titles seem to prove them wrong.

Until the bubble burst last year, a few publishers had been making a killing. But now Shiva – one of the first in, and publisher of 40 titles – has gone into receivership.

Even big names such as Penguin, Pitmans and Longmans have burnt their fingers and are pulling out of computer books or cutting back.

Simon Dally, a former editor at Century Communications, sees the publishers themselves as mainly to blame. He said: 'With other types of book you know the writer, you can read the book and you can judge the market.

'With computer books, however, it's a new area and publishers don't have the technical knowledge to decide whether a book's good or bad.'

Some publishers have learnt their lesson. Chris Coyer, of Holt Saunders, said: 'The market has changed – there's no longer any demand for beginners' guides and we are moving into serious applications and business books.'

But Penguin Books, which was late moving into computer books, saw the problems as outside its control. A spokeswoman said: 'The 1984 autumn slump in sales of home computers has affected book sales; we're still carrying on publishing computer books but we're very cautious.

Shiva Publishing was perhaps more vulnerable than most, as it concentrated on the 'low end' of the market, but until the end of 1983 it was doing well with its Friendly Micro series of beginners' guides and little competition. However, over-ordering in the run-up to Christmas led to a glut of Shiva books on the shelves and in 1984 severe cash flow problems set in.

The official receiver for Shiva, Thornton Baker, was quick to blame Shiva's problems on the downturn in home micro sales in 1984. But Bruce Smith, author of nine Shiva books thinks differently. He said: 'They were simply too ambitious and expanded too quickly while some titles were of poor quality – and that's true of other publishers.'

Indeed, if a publisher gets it right, books do sell well. For example, the *Hacker's Handbook* from Century, has sold 30,000 copies and has been reprinted. Sales of other micro books average between 5,000 and 7,000. Its success is attributed to the topical subject matter: the book was released just after Prince Phillip's Prestel mailbox was 'hacked'.

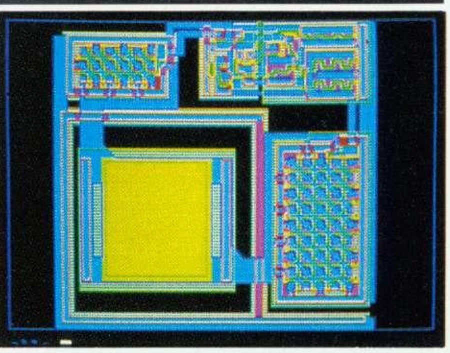
Acorn workstation

Continued from page 7

interface and a gateway to British Telecom's fast X25 data network is near completion.

Although Acorn signed an agreement with software house Logica to port Xenix (Unix operating system version for micros) onto the 32016, it is not supported on the Workstation. This is believed to be because the memory management unit, a part of National Semiconductor's 32016 chip set which is vital for Xenix, is not ready. However, a socket for this is left on the processor board.

Acorn has written its own operating system called Panos for the machine.



This screen shot shows design software for silicon chips taken from a package written by Acorn for the 32016-based micros. The company has been using the programs within its VLSI tools group to develop custom chips. The software may be released for sale

The standard Workstation comes with 1Mb of RAM for £5845. This can be upgraded to 4Mb at £1000 per Mb. A major debate in the software industry will be pricing strategies for mainframe packages on the Workstation which traditionally cost several times as much as the micro itself.

THE MAN FROM U.N.C.L.E.



Our regular columnist has some advice for the ready-less

DID you know that the *View* family from Acornsoft now has four members? You have *View, Viewsheet, Viewstore* and *Viewspell.* But where do you put them? If you have discs, there are only two spare ROM sockets and Acorn frowns upon ROM extension boards, even to the extent of saying that they invalidate your guarantee.

Not only that, but other Acornsoft plug-ins like the graphics extension ROM and the new Basic Editor access screen memory directly and don't work over the Tube. Is nothing sacred? Don't these people read the holy tablets which say that these are offences against nature?

I reckon that we should call a special meeting of the League Management Disciplinary Committee and start withdrawing a few luncheon vouchers.

That would bring them to heel all right.

I see Uncle Clive is having a bit of trouble with the readies. Fifteen million of them to be precise, not to mention the problem with the surgical boot.

Well I warned him. Cut down on the fags, I said. Stop bringing bottles of Newcastle Brown back from the pub. If you must carry on drinking after hours, at least buy it from Tescos – it's so much cheaper. But would he listen? No. 'There's plenty more where that came from lad,' he'd say, cracking another flagon.

So now it's the undignified shuffling around, flat cap in hand, following in the footsteps of arch-enemy, Rhogan Josh Curry in the search for a benefactor.

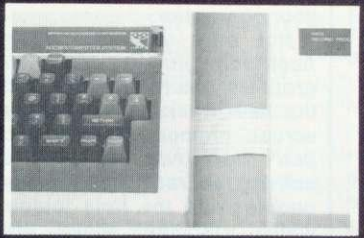
At the time of writing, as we ace journalists say, all potential sugar-daddies seem to be keeping their hands firmly in their pockets, whistling and looking the other way. He's a tough guy though, old Clive, rather in the mould of John Wayne I always think.

Simply light

ALTRA ENIGMA DISC IMAGER is a very powerful 16K ROM which reaches parts of the disc that no other ROM can.

Enigma gives you 33 more disc commands. Enigma will image any disc, intercept calls to osbyte, read and write deleted data, edit irregular sectors, repair bad tracks, unlock locked tape files, displays the disc ID information, dual formats, transfers tape to disc, disassembles code from the disc, selectively copies files, displays calls made to osbyte, displays calls made to osword.

The above are some of the very powerful commands in Enigma. If you have a BBC disc system the Enigma will prove invaluable. Enigma is 6502 tube compatible.



ALTRA TUBE EDITOR is a new and unrivalled full labelling disassembler and editor ROM for the BBC and the second processor. Some utilities of Altra Tube Editor are append labels to those in memory, disassemble in 6502 and 65CO2 mnemonics, end file overlay, delete given label, delete hex range, delete markers, dump memory, edit memory, overlay files, find strings and bytes, define a hex region, define a label, list memory, load labels, list labels, set memory, calculate and print values, print embedded text in a program after a call, saves ROMS, saves labels. Altra Tube Editor also supports many of the 6502 "Illegal" opcodes.

Altra Tube Editor functions in the BBC as well as in the 6502 second processor.



ALTRA PROBE is a 16K ROM giving you 40 more utilities not available in any other single ROM.

Probe gives you an assembler text formatter, lists a basic programme from file, disassembles, sends screen graphics to printer, memory editor, turns the tube on and off, lists basic variables, moves a program in memory, Altra Probe also contains the complete basic-ed utilities. Altra Probe is an essential utility for all machine code and basic programmes.

Altra Probe is available for use with the 6502 second processor.



ALTRA BASIC-ED is an ideal ROM for the basic programmer giving you the most advanced utilities available. Basic-Ed will list matches, number matches, selective or global replace, bad programme relink, copy a block or line into another position, super pack, relocate, renumber, unpack, tables any line number references by goto's etc., tables every variable, formats listings.

Altra Basic-Ed is available for use with the 6502 second processor.

ALTRA FIRSTAID 1·1 is an economy 8K utility ROM designed for the basic and machine code user. It offers a large number of very useful routines in a simple to use form.

Altra Firstaid 1·1 will disassemble, dump ASCii and Hex, list sideways ROMS, prints the top of the variable table, has a free space calculator, calculates the checksum of any sideways ROM, searches for a string, strips REMS, clears all variables, clears RAM from S400 to S8000, has a machine code monitor, lists the OS calls with their vectors, lists the first 24 control codes.

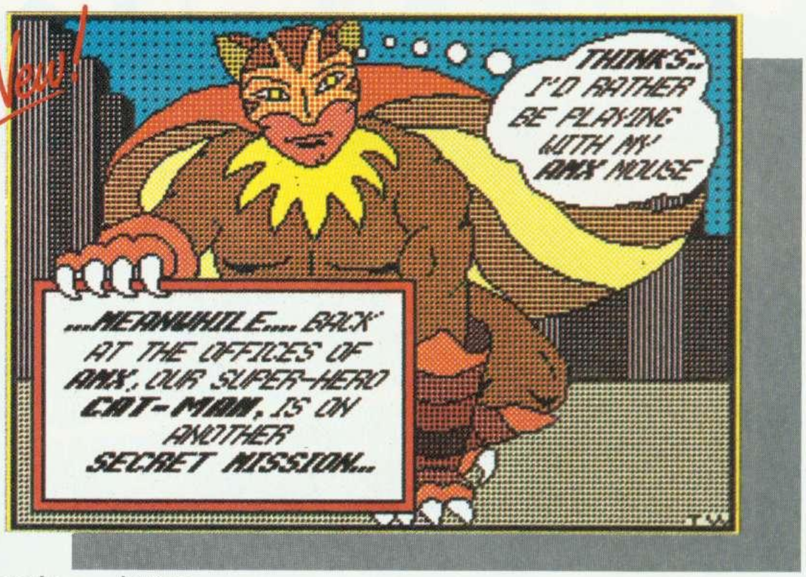
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☐ PROBE 1 £39 ☐ F/AID 1·1 £19 ☐ BASIC—ED 2 £35
☐ ALTRA Tube Editor £49
I enclose the total sum of my order £
Cheque P.O. or Credit Card Number
☐ I enclose my order for the above products
☐ Please send information sheet on
S.A.E. enclosed
Name
Address
ALTRA ROMS
209 North Street
Leeds LS7 2AA

AMX MOUSE

ULTIMATE GRAPHICS FOR THE BBC MICRO MODEL B

New!



AMX PAINT POT — DISC ONLY £14·95 INC VAT

Finalist for Peripheral of the Year...that's how successful the AMX MOUSE is. Supplied as a package with the superb ICON DESIGNER and AMX ART programs, it has proved enormously popular. Not to mention the recently launched AMX UTILITIES and AMX DESK. And now Advanced Memory Systems brings you an exciting new addition to the AMX software range – AMX PAINT POT!

PAINT POT lets you fill in with colour any pictures you've made with AMX ART. Now you can bring your drawings to life with rich, vibrant colours. And with a palette of 256 different shades, you certainly won't be short of inspiration! The software even includes eight exciting pictures to start you off.

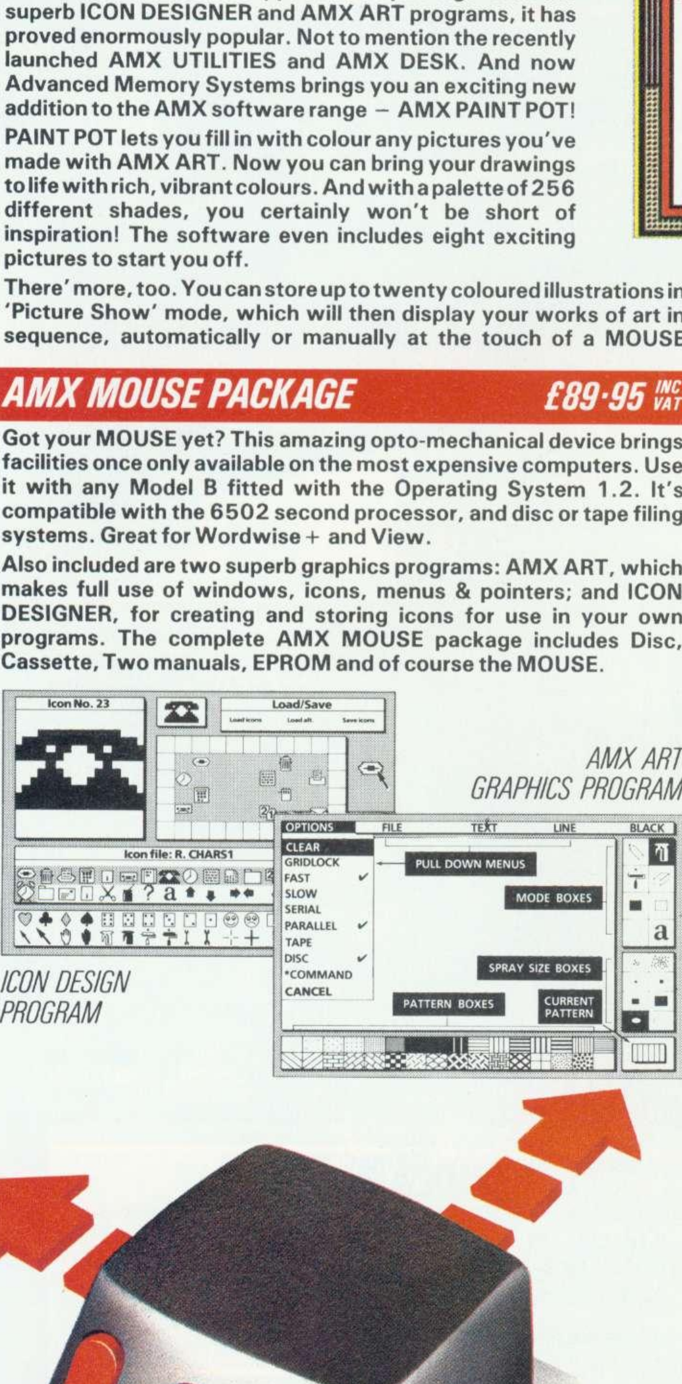
There' more, too. You can store up to twenty coloured illustrations in 'Picture Show' mode, which will then display your works of art in sequence, automatically or manually at the touch of a MOUSE button.

It's brand new...it's educational...and it's great fun! Don't miss this quality product from AMS; avoid the rush by ordering NOW.

AMX MOUSE PACKAGE — £89·95 INC VAT

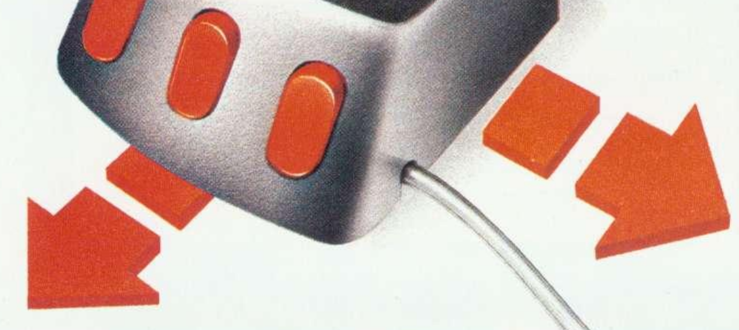
Got your MOUSE yet? This amazing opto-mechanical device brings facilities once only available on the most expensive computers. Use it with any Model B fitted with the Operating System 1.2. It's compatible with the 6502 second processor, and disc or tape filing systems. Great for Wordwise + and View.

Also included are two superb graphics programs: AMX ART, which makes full use of windows, icons, menus & pointers; and ICON DESIGNER, for creating and storing icons for use in your own programs. The complete AMX MOUSE package includes Disc, Cassette, Two manuals, EPROM and of course the MOUSE.

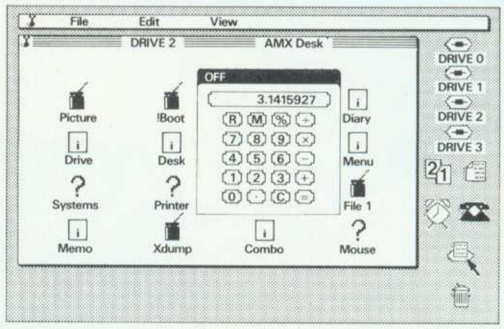


AMX ART GRAPHICS PROGRAM

ICON DESIGN PROGRAM



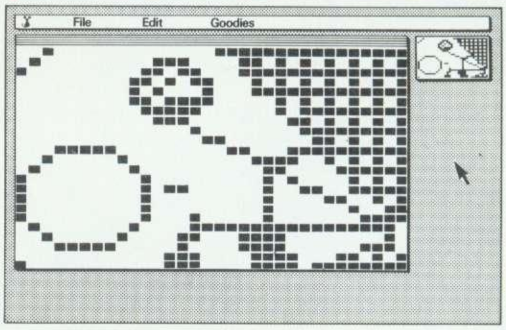
AMX DESK — DISC ONLY £24·95 INC VAT



DIARY
ALARM
MEMO PAD
CALCULATOR
ADDRESS BOOK
TELEPHONE BOOK

Get organised at home or in the office with AMX DESK. Main screen shows a desktop with header offering SYSTEM, FILE, EDIT and additional menus. Point your MOUSE to select these invaluable aids: MEMO-PAD for up to 3 pages of text, TELEPHONE/ADDRESS BOOK with 200 or 400 scrolling entries, DIARY with 3 months' calendar, or ALARM to remind you of appointments. And bring a full-function CALCULATOR on-screen at any time. Any window can be dumped to your printer at the touch of a button. You'll wonder how you ever managed without DESK!

AMX UTILITIES — DISC ONLY £14·95 INC VAT



ZOOM
ICON USER
ROTATE/REFLECT
PATTERN DESIGNER

AMX UTILITIES is another excellent program with a host of graphics features. There's a zoom facility for accurate amendments to your drawings: one dot becomes a character. You can also move, copy, rotate and reflect; enhance circles; draw ellipses and arcs; and print icons. Borders can be added, and pictures stripped and centred for saving and printing.

All these exciting products are available from good computer dealers. Or POST-FREE from Advanced Memory Systems Ltd, Green Lane, Appleton, Warrington WA4 5NG. Please send cheque or PO. For instant ACCESS or VISA orders, Ring (0925) 62907/602690.

News in brief

□THREE modem manufacturers are offering free quarterly Micronet subscriptions, worth £10, with their hardware. The modems involved are the Prism 1000, Pace Nightingale, Tandata TM1-10 and Miracle Technology's WS2000.

□MICRONET's Gallery feature, where subscribers can put up their own frames on the system, has been an overwhelming success, according to a Micronet spokeswoman.

Over 2000 frames were bought during the first week and there's already a soap opera called Dallasty and a thriving Gallery user group.

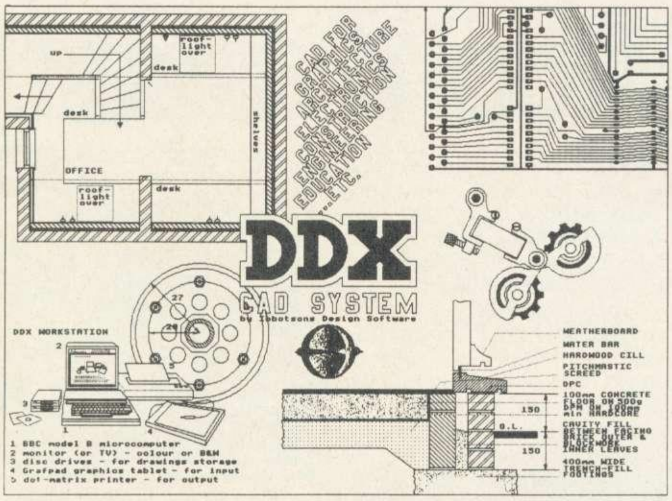
British Telecom has recently bought a 25 per cent stake in Micronet with Bell Canada buying another 20 per cent. UK publisher EMAP still has the controlling share.

□IMPART Technology has produced a logic analyser add-on for the Beeb which can monitor up to 24 data channels. The Model A1024 costs £750. The unit allows clock rates between 20Hz and 10MHz, and there are various trigger options. Up to 30 data traces can be saved to disc.

Contact Impart Technology on (0462) 33100.

□THE Votrax speech synthesiser turns typed words into the real thing, adding speed and emphasis as necessary. The unit costs £375 and also offers eight-octave music and sound effects.

Typical applications include automatic phone messages, voice-overs for audio-visual presentations and, in the education sector, speaking textbooks. Contact Cyber Robotics on (0785) 812121.



DDX: accepts input from mouse, joystick, graphics tablet and keyboard

Terrific draft from computer software

DDX is a computer-aided drafting system for the BBC micro which will work with a variety of printers and plotters.

The software package, by Ibbotsons Design Software, will accept input from mouse, graphics tablet or joystick, as well as the keyboard.

Scale drawings are produced using single key commands, while distances, angles and co-ordinates are automatically calculated and displayed on the screen. The package costs £125 (more for some of the plotter options).

3D View is a related program which allows perspectives to be generated of 'wire frame' models and viewed from any distance or angle. Prices start at £35 and, again, there are versions to drive various plotters.

The next package is a bit specialised. Insulation and Condensation Evaluator (ICE) is a design aid for those in the building trade. Price is £35 and Ibbotsons Design Software can be contacted at The Byre, Ecclesbourne Lane, Idridgehay, Derbyshire DE4 4JB.

Micad is a suite of low-cost drawing programs aimed at the educational sector. It can produce 2D and wire-frame 3D drawing, and will work with the Penman plotter. Price is £29.95 from Heinemann Educational Books 01-637 3311.

Moving upmarket, Easicad is a £495 2D drafting package produced by Denford Machine Tools, who specialise in CAD/CAM training systems. Features include: symbols, dimensions, text, hatching and four colours. Contact Denford on (0484) 712264.

Down-to-earth micros help the high-fliers

by Geoff Nairn

THE Royal Air Force has installed BBC micros at every station in the country for training air traffic controllers. The Beebs are used as simple simulators to represent the air traffic controller's radar screen with 'aircraft' positions, shown by blobs, controlled from the keyboard.

The software was developed by the RAF's training school for air traffic controllers (ATCs) at Shorebury, and was written by Flt Lt Nigel Williams on his own Beeb at home. The RAF big-wigs were so impressed that they bought BBC micros for all 45 stations.

The system fills a training gap between classroom theory and practice on a full-blown mainframe simulator.

'Talk down'

The software comes on EPROM, with a disc containing a geographical outline of the region around each RAF station. This is superimposed onto the screen and the trainer supplies information on plane speeds, headings, flight levels and the like.

The student then has to 'talk down' several different planes, at the same time changing their flight paths using the keyboard. Exercises of varying complexity can be loaded from the disc and run, before letting students loose on the £2million mainframe simulators.

The system will be shown on a *Micro Live* TV programme in the autumn, when Lesley Judd can be seen at a BBC micro, narrowly avoiding a mid-air collision.

Terrifying

In fact, to introduce the programme a BBC TV crew were taken up in a helicopter which then had a real-life 'near miss' with a Jet Provost. The RAF said it was all planned, but *Micro Live* producer Patrick Titley, who was in the helicopter said it was still pretty terrifying.

***Micro Live* returns to BBC2 on Friday, October 11. Times have yet to be set, but it will be early evening, and the show will be weekly (see page 18).**

Reporter hacks playgroup program

by Bill Penfold

OH DEAR! This is embarrassing. Better get it off my chest right away . . . Terribly sorry Pre-school Playgroups Association, my deepest apologies: I was the one who mucked up your computer program.

It happened at the House of Commons, so at least it was the right place to make a muck-up of things.

The ladies of the PPA had a week-long display explaining their work to MPs. Pride of the demonstration was an individual print-out for MPs about playgroups in their own counties run by Sue Mastel with her home Beeb.

Sue's DIY program worked like a dream, churning out information for our legislators. Simple but efficient, it was foolproof – until I came along.

Your trusty Parliamentary Correspondent crashed the program. Oh the shame! What was worse, I couldn't get it to printout again.

Fortunately, next day the Beeb was back in business.

By the end of the week a train of MPs had collected their print-outs. Sue Mastel's only disappointment was that, her own MP was not amongst them. The Mastels live in Finchley; local MP, one Margaret Hilda Thatcher. Probably a bit busy that week.

The following list from Computer Marketplace Exhibitions gives the companies which had confirmed stand space by June:

A&B Computing
Acorn Computers
Acorn User
Acornsoft
Advanced Memory Systems
Ahkter Computer Group
Alpha Disc Ltd
Aries Computers
BBC Publications
Beebug Publications
Beebugsoft
Bel Tech
Brainstorm
British Micro
British Telecom
Bucon
Cambridge Electronic Design
Cambridge Microprocessors
Care Electronics
Cats Ltd
CJE Micros
Collins Publishing Ltd
Commotion
Computer Bookshops Ltd
Computer Concepts
Computer Supplies
Cumana
Dealer Deals
Demon Products
Discotech (UK) Ltd
Educational Computing
Electronequip
Eltec
Ergon Products
Fearless Software
Flightlink Control
Gemini
Glentop Publications
HCR Electronic Services
Holly Computers
Intergalactic Robots
Kempston Microelectronics Ltd
L W Staines
LCL Educational Software
Linear Graphics
Logotron
Lowland Design
LVL
MUSE
Mega Marketing
Merlin
Micro Aid
Micronet
Microworld
Micro Computer Supplies
Miniature Tool Company
Norwich Computer Services
Oak Universal Ltd
Opus Supplies Ltd
P B Electronics
Pace
Peak
Pilot One
Popular Computing Weekly
Ramamp
Redwood Publishing
Robocom
Shard Software
Slogger Software
Softlife
Solidisk Technology Ltd
Sunshine Publications
System
United Disc Memories Ltd
Viglen Computer Supplies Ltd
Vine Micros
Watford Electronics
Weserve
Wigmore

Acorn User shows

THE THIRD OFFICIAL ACORN USER EXHIBITION

YES, it's the one you've been waiting for – the Third Acorn User Exhibition, which runs from Thursday, July 25 to Sunday, July 28 at the Barbican Centre in London.

Up to 40,000 people are expected to pass through the Barbican's doors over the four days with more than 100 exhibitors waiting for them.

This year the show will be divided into sections covering home, business, education, robotics and communications, with an area done up as an amusement arcade, where you can try your hand at the latest games releases.

There's a range of prizes on offer, including two complete BBC micro systems, a Zero 2 robot, a Logotron sprite board and various software.

The B+ will be in action, and Acorn's Cambridge Workstation boasting 4Mb of memory and the power of a minicomputer will be on display.

This year Acorn will be making a special effort to reach the business market with its range of professional software, including the new Farming Package.

Acornsoft will be showing off *Revs* and *Elite II* – a second processor version of the best-selling game. A new company, Weserve, will be launching some ROM-based software which allows *Elite* players to dispense with the keyboard. All the main functions in the game can be controlled using just a Voltmace 14B joystick.

As a possible rival to Acornsoft's motor racing game, there's *Chicane* from Kempston, which will get its first public showing at the exhibition. The game is available for both the Beeb and Electron, with tee-shirts and the like to tempt the boy racers.

For the more intellectual gamesters, Shards will be launching three new adventures: *Galilee, The Lost City* and *Middletown*.

On the telecommunications front, British Telecom will be demonstrating its latest products, including the Electron-based Healthnet system.

Robots are very much in evidence this year and Commotion will be showing the products it distributes, including the Beasty, the Snap Camera System, Movits and the Fischertechnik kits.

L W Staines will have the Ogre range of robot arms on show – prices start at £195 – and it will be launching the Troll at £750, a two-armed robot with extending arms which can do complex tasks, eg, screwing a nut onto a bolt.

For business users, there's desktop software for the AMX mouse and Acorn User's own CP/M man, Ed Brown, will be

AU to launch User Dump

ACORN USER releases the second in its User range of products at the Show.

User Dump is a printer utility ROM costing £19.95 for Epson compatible printers. And User-RAM, AU's own easy-to-fit sideways RAM board, will be on sale. The basic pack costs £45.50 and contains the RAM chip, connecting lead, software utility disc and instruction booklet, or there's a 'de-luxe' pack at £62 for all this plus 22 more utilities and Bruce Smith's *BBC Micro ROM Book*.

Clares is already producing a disc version of its BROM utility software which can be loaded into the User RAM.

Another *Acorn User* product to be available for the first time at the exhibition is a cassette containing all the graphics programs we've presented in the magazine in the past.

At £3.75 it's a bargain for budding artists.

Where and when

The Show runs from July 25 to 28 at the Barbican Centre, London EC2. Hours are 10am to 6pm, apart from Thursday 25 which is trade only until 1pm, and the last day, Sunday 28, when the Show will close at 4pm.

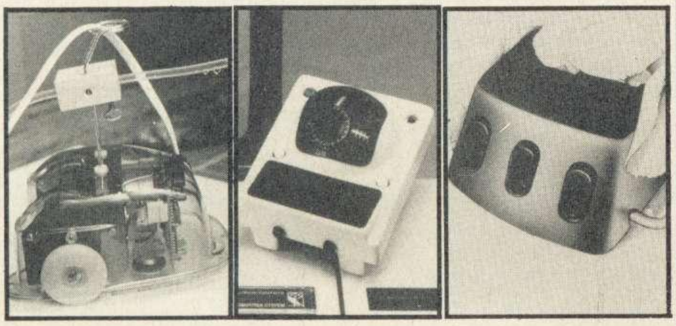
How to get there: BR train to Holborn Viaduct, Cannon St, Broad St, Kings Cross, St Pancras or Liverpool St. Underground to Moorgate, Barbican, St Pauls, Bank or Liverpool St.





Kempston and Acornsoft will be battling it out at the Show with rival motor racing simulations. Lined up on the grid we have Kempston's *Chicane* and Acornsoft's *Revs* and you'll be able to try your hand at both games. Kempston and Acorn run real-life motor racing teams — Kempston competes in Formula Ford 2000 and Acorn in Formula 3.

for third time



Three to watch for: Zero 2, Bitstik and AMX Mouse

on hand to answer questions. Gemini has its new Triple-D integrated business suite of database, spreadsheet and graphics on show.

On the graphics front, Robocom will be launching Bitstik 2, which adds extra drafting facilities to the existing Bitstik 1 CAD system. Cost is £795 but users of the older version can upgrade for £450.

Other CAD-style packages include Peak's Superdraft drafting software at £950; the Plotmate plotter at £300 and a new graphics tablet, Grafpad II, which sells for £299.

The range of hardware addons for the BBC micro continues to grow. The Aries-B32 gives your Beeb the memory of a B+ (see page 9) and Aries is offering discounts on the B20 board and the Music 500, which allows you to compose computer music and play it back on a hi-fi system.

Acorn User will again have its own stand where you can meet your favourite authors. Back copies and listing-cassettes will also be on sale – as well as several new products.

Admission to the Exhibition costs £3 or £2 for under-16s. You can save £1 by reserving tickets in advance – contact the organisers, Computer Marketplace Exhibitions at 20 Orange St, London WC2 or phone 01-930 1612. For block bookings of ten or more people the price is only £1 per person.

A voucher giving 50p off show entry is on page 7 of this issue

AUTHORS

	Thurs	Fri	Sat	Sun
Mike Barwise		am/pm	am/pm	
Ed Brown			am/pm	
Chris Drage			am/pm	am/pm
Nick Evans	/pm	/pm	/pm	am/pm
George Hill				
Martin Phillips	/pm			
Harry Sinclair			/pm	
Joe Telford	/pm	am/pm	am/pm	
Simon Williams	am/pm	am/pm		

STAFF

Kitty Milne, Bruce Smith and Tony Quinn will be around for most of the four days, magazine schedules permitting.

AT the Show you can meet your favourite *Acorn User* authors, as most contributors have agreed to put in an appearance (see above).

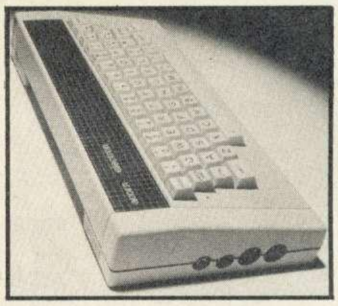
Ed Brown will be running his CP/M corner, you can talk printers with George Hill and Martin Phillips will be offering his hints and tips. Mike Barwise will be on hand for you Atom die-hards and teachers Nick Evans and Chris Drage will be talking class.

The *Acorn User* staff will also be in attendance and there'll be a stand where you can buy *AU* goodies.

Easy to enter competition at the Acorn User Exhibition

First prize BBC B+ worth £499





Second prize Acorn Electron worth £129

Just answer the five simple questions below, fill in your entry and hand it in to the *Acorn User* stand at the Exhibition and you could win one of two micros on offer. The first two correct answers taken from a hat at the end of the Exhibition will win the computers. All entries must be handed in to the stand by 3pm on Sunday, July 28.

1. **Which computer language for the BBC micro uses reverse Polish notation?**
   a) Forth b) Lisp c) BCPL
2. **Which *Acorn User* author is best at dropping hints?**
   a) Joe Telford b) Martin Phillips c) Nick Evans
3. **Which processor chip is at the heart of the Electron?**
   a) 6502 b) 32016 c) Z80
4. **Which micro has sold the most into small businesses?**
   a) Sinclair QL b) BBC B c) Elan Enterprise
5. **How many interfaces are there on a BBC B+ (excluding auxiliary power unit)?**
   a) 7 b) 9 c) 11

Write a,b or c, which ever you think is the right answer alongside each question number on the cut-out entry form below, and hand it in to *Acorn User* on stand 45 at the Acorn User Exhibition. To qualify for the competition, the cut-out form must be handed in at the Exhibition. Winners will be notified by post and the names announced in *Acorn User*. The Editor's decision is final.

Cut out this coupon and hand it in to *Acorn User* on stand 45 at the Acorn User Exhibition at the Barbican (July 25-28). Write your choice of answer, a, b, or c in the box alongside each question.

1		**Name**..
2		**Address**..
3		....
4		....**Post code**....................
5		**Telephone number**..

On show

☐July 12-13, Artificial Intelligence for Society, Brighton Polytechnic, Lewes Rd, Brighton. Conference for educators, social workers and others interested in AI. Fee £45 – or £10 per day for teachers, students and unemployed. Details on (0273) 693655.

☐July 25-28, Acorn User Show, Barbican, London. If you go to only one computer exhibition this year make sure it's this one!

☐July 25-27, Networks 85, Wembley Conference Centre, London. Business exhibition devoted to computer and telecommunications networking. Enquiries on 01-868 4466.

☐July 29-31. MUSE Summer Course, Jesse Boot Conference Centre, Nottingham University. Further details on (0482) 20268.

☐September 28, Micros in Weather Education, Chelsea College, University of London. One day conference organised by the Royal Meteorological Society. Details from the Executive Secretary, RMS, James Glaisher House, Grenville Place, Bracknell, Berks, RG12 1BX.

To contact

☐Technomatic's bulletin board service, containing information on products the company stocks, is open 24 hours on 01-452 1500. Baud rates: 1200/75 (Prestel compatible) or 300 baud.

☐Acorn's own dial-in viewdata service is on (0223) 243642. Baud rate is 1200/75.

☐Teachers interested in the Acorn Micros in Schools scheme can contact Acorn's education division on (0223) 245200.

☐Artur Fischer (UK), distributors of the Fischertechnik robot kit, can be contacted on Marlow 72882/6.

☐BBC TV 's *Micro Live* bulletin board is on 01-579 2288 (type INFO BBC on Telecom Gold electronic mail system).

☐BBC Computer Literacy Project, Broadcasting Support Services, PO Box 7, London W3 6XJ. Please send self-addressed envelope.

☐Bulletin Boards:
CABB 01-631 3076
CBBS Cumbria (06992) 314
CBBS London 01-399 2136
Distel 01-679 1888
Forum 80 Hull (0482) 859169
Forum 80 London 01-902 2546
HAM-NET (0482) 497150
Liverpool Mailbox 051-428 8924
Mailbox 80 (0384) 635336
Microweb 061-456 4157
TBBS London 01-348 9400
TBBS Nottingham (0602) 289783
TBBS Southampton (0703) 437200

☐Bardsoft database contains information on a wide range of software for the handicapped. Details from Handicapped Persons Research Unit, Newcastle-upon-Tyne Polytechnic, Newcastle, NE7 7TW. (0632) 358211.

☐CABE (Computers in Adult Basic Education), c/o Pete Jeffs, Southern Neighbourhood Council, Hyslop St, Liverpool 8. User group for ABE tutors in Adult and Further Education. Please send sae.

☐MEP (Microelectronics Education Programme), Cheviot House, Coach Lane Campus, Newcastle-upon-Tyne, NE7 7XA. Hardware and software support for schools. Please send sae.

☐MAPE (Micros and Primary Education), c/o Barry Holmes, St Helen's Primary School, Bluntisham, Cambs. User group for primary teachers. Please send sae.

☐MUSE (Micro Users in Schools and Education), Freepost, Bromsgrove, Worcs B62 7BR. User group for teachers and parents. Please send sae.

☐National Extension College, 18 Brooklands Ave, Cambridge CB2 2HN. Educational and training courses on the BBC micro. Please send sae.

☐CET (Council for Education Technology), 3 Devonshire St, London W1N 2BA. Government body which oversees MEP. Please send sae.

For help

☐To contact *Acorn User* authors, write c/o the editorial address given on page 2 of this issue.

☐Seikosha AP/GP100 printer help sheets are available from *Acorn User* for 50p, plus sae. These consist of three programs, including a screen dump, and three pages of notes on using these printers.

☐Monitor choice: photocopies of the review of four monitors, plus a set of nine test programs from the June 1984 issue, cost 72p (inc post). A copy of the issue costs £1.25 (see page 93).

☐For *Acorn User* cassettes, discs, back issues, binders, contact PHS Mailings on (02937) 72208 (see page 96).

On television

☐*Database*, ITV, Thursdays, times vary with region. July 11: focus on robotics – including a football match played by robots. July 18: a look at graphics and aids for the handicapped. July 25: music on the micro plus icon systems. Every programme includes software for the Beeb transmitted by Visicode. Listings available on Oracle page 159.

☐*Micro Live*, BBC2, Fridays 7.30pm. Series returns in the autumn on a weekly basis starting October 11. Already in the pipeline are specials on computers and music, artificial intelligence and a report from the US on the latest research into what must be the ultimate in computer storage – individual molecules!

Basic 1 to Basic 2 conversion

☐All programs submitted to *AU* must run on Basic 1 (except for Basic 2 tutorial programs). Unfortunately this will take several months to come fully into effect so in the meantime we are printing a Basic 2 simulation program (listing 1) which enables Basic 2 programs to run on older BBC micros fitted with Basic 1. To find out which version you have, switch on the machine and type REPORT – Basic 1 will respond with '1981', Basic 2 with '1982'.

The program below shows how EQUB, EQUD, EQUW, EQUS and OSCLI can be simulated. This topic was fully covered in the January 1984 issue of *AU*.

Blunderbox

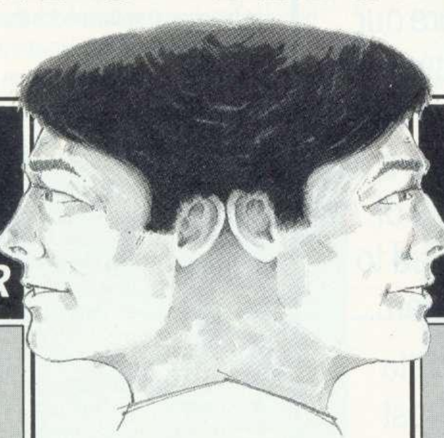
☐In Richard Harris' listing of Sideways RAM Utilities (June issue) a few lines were inadvertently cut short:

```
20790 OPT FNequs(" Abo
ut to format drive ")
20810 OPT FNequs(" Pre
ss SPACE to continue")
20900 OPT FNequs(" fai
led track ")
20920 OPT FNequs(" dis
c not empty")
```

```
10 REM Simulating Basic II from I
20 REM by Bruce Smith
30 REM for BBC with Basic I
40 REM (c) Acorn User August 1985
50 :
60 FOR pass=0 TO 3 STEP 3
70 P%=&C00
80 [OPT pass
90 LDX #0
100 .loop
110 LDA base,X
120 JSR &FFE3
130 INX
140 CMP #13
150 BNE loop
160 RTS
170 .base
180 OPT FNequb(&7)
190 OPT FNequw(&4341)
200 OPT FNequd(&204E524F)
210 OPT FNequs("USER")
220 OPT FNequb(13)
230 ]NEXT
240 CALL &C00
250 PROCoscli("HELP")
260 END
270 :
280 DEF FNequb(byte)
290 ?P%=byte
300 P%=P%+1
310 =pass
320 :
330 DEF FNequw(word)
340 ?P%=word MOD 256
350 P%?1=word DIV 256
360 P%=P%+2
370 =pass
380 :
390 DEF FNequd(doubleword)
400 !P%=doubleword
410 P%=P%+4
420 =pass
430 :
440 DEF FNequs(string$)
450 $P%=string$
460 P%=P%+LEN(string$)
470 =pass
480 :
490 DEF PROCoscli(A$)
500 DIM X% 256
510 Y%=X% DIV &100
520 $X%=A$
530 CALL &FFF7
540 ENDPROC
```

Listing 1. Enables programs written in Basic 2 to run on BBC micros fitted with Basic 1

IT'S GREAT BEING TWO-FACED



QFS DISK FILING SYSTEM FOR THE BBC MICROCOMPUTER

- Simple installation – plugs into existing empty sockets.
- No soldering required job complete in under 15 minutes.
- Designed to be compatible with most Acorn Disk Software.
- Double Density capacity is 18 sectors per track, giving a massive 1.4 mega bytes.
- QFS kit contains a 16k ROM containing the firmware. A small printed circuit board contains disk controller and associated custom IC. In addition there are a further 7 support IC's and a link to plug into the BBC micro PCB.
- The QFS comes complete with operating manual and full fitting instructions including diagrams.

AND TWICE AS DENSE

Because Cumana's QFS and Electron interfaces are DOUBLE DENSITY they provide extra storage capacity and increase file space.

ELECTRON DISK INTERFACE

- Plugs straight into electron's plus-one expansion.
- Compatible with 5¼" and 3½" disk drives.
- Up to 89 file names can be stored on each disk.
- Interface contains a real time clock/calendar which allows time and date stamping of saved files.
- Interface comes in hard wearing BBC beige cabinet, complete with operating manual.

ELECTRON INTERFACE £115.95 Inc VAT postage & packing £1.50 extra

QFS £79.95 Inc VAT postage & packing £1.50 extra





ORDER FORM

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BROAD STREET, GUILDFORD, SURREY, GU3 3BH.
TEL. 0483 503121.

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I enclose cheque/PO* for .... or debit

my access/visa card* no .... *Delete as applicable

Name ....

....

Address ....

....

CUMANA®
The best name in memory

GEMINI DON'T HANG AROUND

Whilst we're proud to stand and admire our tried and tested range of serious software for the BBC micro — we don't hang around. Our development team are all too aware of the need to keep up with the demands of tomorrow's user and so we are pleased to introduce to you the ***'TRIPLE-D'*** system.

At last, TOTAL INTEGRATION and data file compatibility between the three most important utility packages for your BBC micro disk system — Database, Spreadsheet and Graphics. Take a look at the specification.

THE REVOLUTIONARY 'TPLE

Of great significance to businessmen, educationalists and hobbyists alike, these programs are certainly the most powerful and sophisticated of their breed, and may be used 'stand-alone' or together as a suite. Gemini have probably the most experience in writing serious software for the BBC micro, with classics such as BEEBCALC and BEEBPLOT achieving sales of tens of thousands of units. We have drawn on almost four years of experience and user feedback to produce what we are confident will be hailed as the ultimate in functional software for the BBC micro: the ***'TRIPLE-D'*** Integrated Suite. We've also brought it in at a price that should make it accessible to more of you, and most importantly, we're giving you REAL value for money.

DDD-BASE £29.95

- Up to 2000 records, 1 search level subset, 26 fields/record, 2 drives, 79 chars/field
- Scrolling screen, 79 x 26. Interrupt driven real-time clock
- Layout painted on-screen to your design, including background text/graphics
- Fully menu driven, with powerful line editor and access to *OS commands
- Default entry capability, no need for tedious re-typing of repetitive data
- Lightning search using advanced 'hashing' techniques
- Powerful maths, allowing all BASIC functions, on any field
- 10 user-defined variables to simplify complex calculations
- Multiple level 'intelligent' sort — program only sorts 'out-of-order' data
- Printed reports in record or summary format. Data spool option for transfer to other files
- Solidisk/Econet/6502 second processor compatible
- FULL DATA COMPATIBILITY WITH 'DDD-CALC' AND 'DDD-PLOT'

DDD-CALC £29.95

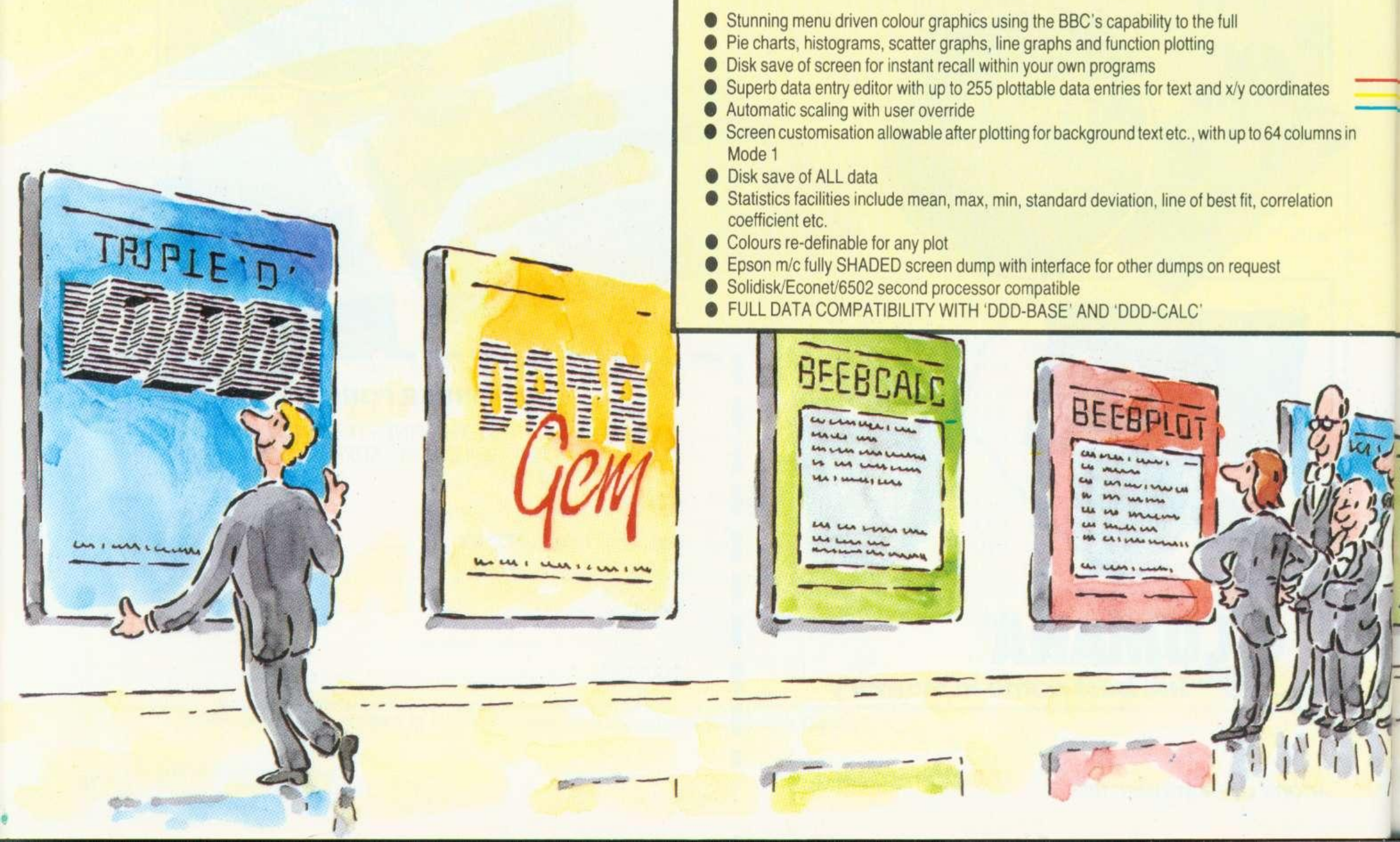
- True disk-based spreadsheet, 2000 rows, 26 columns, 52000 cells. Powerful line editor
- Fast, smooth machine code screen scroll with pop-down menu
- Individually adjustable column widths with text overflow
- Full relative and absolute replication
- Find and move to a row by name
- User defined variables, delete/insert rows, SORT rows with 'DDD-Base'
- Send data from all or part of sheet to printer, or just print cell formulae
- Data over 1 or 2 drive surfaces
- Fast recalculation, even over large files
- All BASIC functions allowed, plus 'SUM', 'MAX', and 'MIN'. *OS calls, and real time clock
- Data spool option for merging with other files
- Solidisk/Econet/6502 second processor compatible
- FULL DATA COMPATIBILITY WITH 'DDD-BASE' AND 'DDD-PLOT'

DDD-PLOT £29.95

- Stunning menu driven colour graphics using the BBC's capability to the full
- Pie charts, histograms, scatter graphs, line graphs and function plotting
- Disk save of screen for instant recall within your own programs
- Superb data entry editor with up to 255 plottable data entries for text and x/y coordinates
- Automatic scaling with user override
- Screen customisation allowable after plotting for background text etc., with up to 64 columns in Mode 1
- Disk save of ALL data
- Statistics facilities include mean, max, min, standard deviation, line of best fit, correlation coefficient etc.
- Colours re-definable for any plot
- Epson m/c fully SHADED screen dump with interface for other dumps on request
- Solidisk/Econet/6502 second processor compatible
- FULL DATA COMPATIBILITY WITH 'DDD-BASE' AND 'DDD-CALC'

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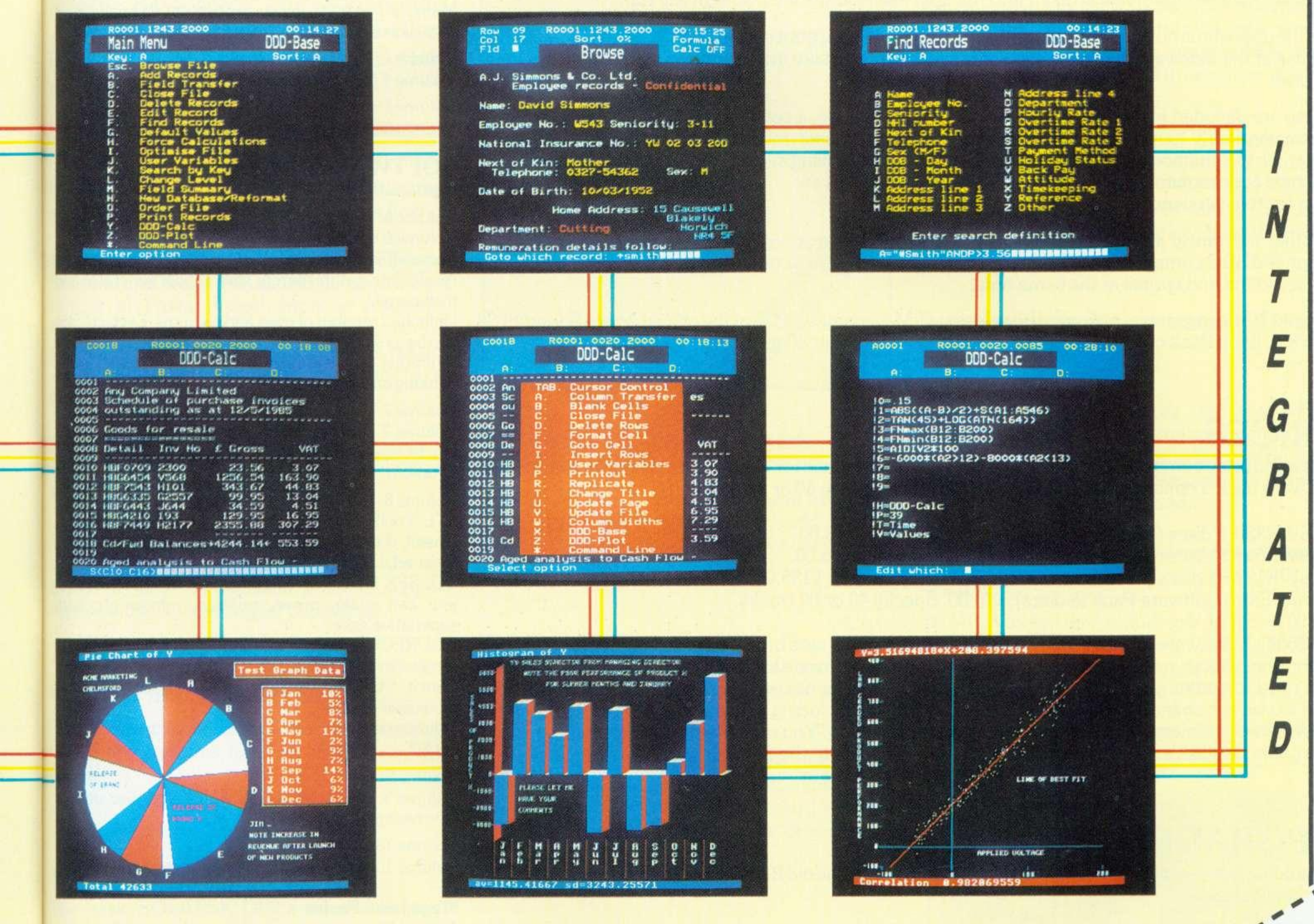
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'TRIPLE-D' BBC DISK INTEGRATED SOFTWARE SYSTEM

The modules, which are formatted for both 40 and 80 track systems, are available separately, or as an economical combination pack. Each module is clearly documented with a comprehensive, indexed manual, with training sections that refer to demonstration applications provided with each disk. Remember, ***'TRIPLE-D'*** uses proper random-access files that will take advantage of your true disk capacity, even over TWO drive surfaces. Have you ever heard of a true disk-based spreadsheet before? Well it's here now in the form of the ***'TRIPLE-D'*** suite and can handle up to 52,000 FILLED cells! If you already have our 'DataGem' ROM database, you'll be pleased to know we've even included some special utilities for you!

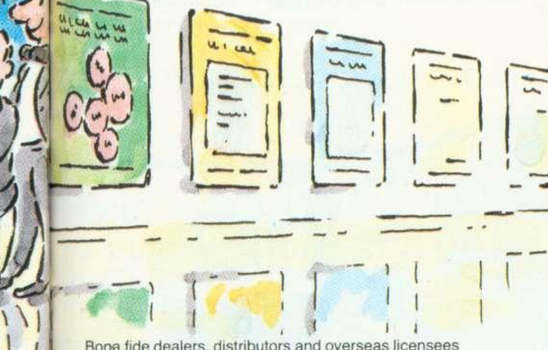
I confidently recommend the ***'TRIPLE-D'*** suite to you. If you purchase the product from us and don't share my enthusiasm, return it to us in new condition within seven days of purchase and we'll refund your money – immediately and without quibble.

Dale Hubbard
Chairman & Managing Director
Gemini Marketing Limited



GEMINI MARKETING LTD Gemini House, Concorde Road, Dinan Way Industrial Estate
Exmouth, Devon EX8 4RS. Tel. (0395) 265165 (4 lines) Telex 42956 GEMINI

Gemini



Bona fide dealers, distributors and overseas licensees for Gemini software always required. Educational establishments contact us for details of our fuss-free licensing agreements.

Express 24 hour credit card orders (Amex, Access) **0395 265165** immediate guaranteed despatch

Gemini, please rush me in dual 40/80 track format:

Ref.	Item	Qty.	£ each	Total
M0101	DDD-Base	....	29.95	....
M0104	DDD-Calc	....	29.95	....
M0109	DDD-Plot	....	29.95	....
M0118	Combo Pack All 3	....	69.95	....

Prices include VAT and post and packing

Cheque/P.O.'s enclosed – ....

Or charge my Amex/Access No. ....

Signature ....

Name ....

Address ....

Or available from leading software stockists

New Computer Games For Solidisk Sideways RAM

SOLIDISK's SIDEWAYS RAM is an almost indispensible add-on for the BBC user.

It is available in either 32k, 64k or 128k byte capacity and is compatible with all issues of BBC microcomputers along with most of the add-ons and ROMs obtainable for it.

To date, more than 40,000 units have been sold.

The sideways RAM occupies the right most ROM socket of the BBC and sits in the same position in the micro's memory map as the paged ROMs.

This means that the Sideways RAM can run almost all ROM type software including languages, utilities and filing systems.

The difference between Sideways RAM and Sideways ROM is that RAM can be written to meaning that only the presently required software has to be loaded into the machine, thus making redundant the multitude of high current consumption and often unsightly ROM extension boards.

Sideways RAM is also an invaluable tool for writing ROM type software to run on the BBC since software may be assembled straight into the area in which the final version will run.

For the user who is not interested in writing ROM type software but is in need of the utilities provided by the use of the Sideways RAM, we supply free software to make maximum use of the Sideways RAM facilities.

These are included in the Sideways RAM Software package, a collection of no less than 5 diskettes containing nearly 100 programs, from database, word processor, music system, sprite graphic, printer buffer, virtual memory, spelling checker, RAM disk, RAM filing system, VDU replay, disassembler, machine code monitor, macro basic, video digitised pictures etc . . . and Solidsk Most Advanced Disk filing System version 2.0.

Another extremely interesting use is to run Solidisk 'Megagames'. They are too large for the non expanded BBC computer, as they make use of high resolution 8 colour (mode 2) screen, background music, sound and sprites at the same time.

Around 70 megagames are planned for release in 5 Megagames Packs at the official Acorn Show (25-28 July 85). Each Pack consists of 5 diskettes, available in either 40 or 80 tracks.

PRICES

The listed price comprises the Sideways RAM fully guaranteed for 1 year, comprehensive manual and software pack 1 consisting of 5 diskettes formatted either in 40 or 80 track.

— SWR32 + 5 discs (32k unit, by far the most popular): £58.00
— SWR64 + 5 discs (64k unit, new introduction model): £85.00
— SWR128 + 5 discs (128k unit, the second most popular): £135.00
— Any Extra Software Pack (5 discs): £10.00. Specify 40 or 80 tracks.

As Solidisk Software Support Service has to produce in excess of 25,000 diskettes every month, we regret that we can no longer provide personalised service for disk washing. In extreme cases, when you need to update your software diskette, either reorder a new software package (which is always sold to you at nominal media cost i.e. £10.00 for 5 disks, including new manual, post and packing) or return the old package with £2.00 to cover post and packing. You may avoid post and packing costs if you call at Solidisk's stand at any BBC micro exhibition or at the Solidisk office.

UPGRADING

Upgrading from a smaller model is very simple: you return the old RAM board to us with your payment for the difference.

The listed prices include new manuals when necessary.

SOFTWARE PACK 1
(included with SWR)

The Software package comprises 5 diskettes, formatted either in 40 or 80 track. Please specify when ordering.

Volume 1:
Volume 1 contains all the general applications of Sideways RAM. Menu, Printer Buffer, STL DFS 2.0, STL E00, RAMDISK, RFS (Rom generator), Fast Backup, Quickcopy, Index etc . . .

Volume 2:
Volume 2 contains the Solidisk Wordprocessor, Spelling Checker and the English Dictionary.

Volume 3:
Volume 3 contains the Solidisk Macro Basic (a program generator), a Linker-Editor, VMP the Virtual Memory Program, Sigen, a program to create your own dictionary and a sample French dictionary.

Volume 4:
Volume 4 contains the Solidisk Database.

Volume 5:
Volume 5 contains the Solidisk Sprites System.

SOFTWARE PACK 2
(optional)

Volume 6:
Volume 6 contains the Solidisk Spreadsheet.
Menu driven with standard options to create, edit, recalculate, print, search, sort, report generator and mailmerge.
Unlimited number of rows and columns. Each column can be as small as 2 or as big as 70 characters. All math functions are supported. Complete with home banking and simple portfolio management.

Volume 7:
Volume 7 contains Solidisk Play Tunes System and lots of tunes and write music using ordinary ABCD notation.

Volume 8:
STL Toolkit has 24 star commands (Status, Rwipe, Check, Find, Search and Replace, Mode 8, Join, Keyload, LVAR, Salvage, Expand, Edit etc . . .).
STL SFX is Solidisk screen effects utility. In mode 2, you can scale, move, reverse, mirror etc with superlative ease.
VDURECORDER is another screen aid utility. It remembers everything sent to the screen. When you want it, *REPLAY will show it all over again but with an incredible speed.
Solimon is a machine code monitor for both 6502 and 65C02.

Volume 9:
Volume 9 contains the STL ADFS and disc utilities (see next page).

Volume 10:
Volume 10 contains the Solidisk Teletext Editor.

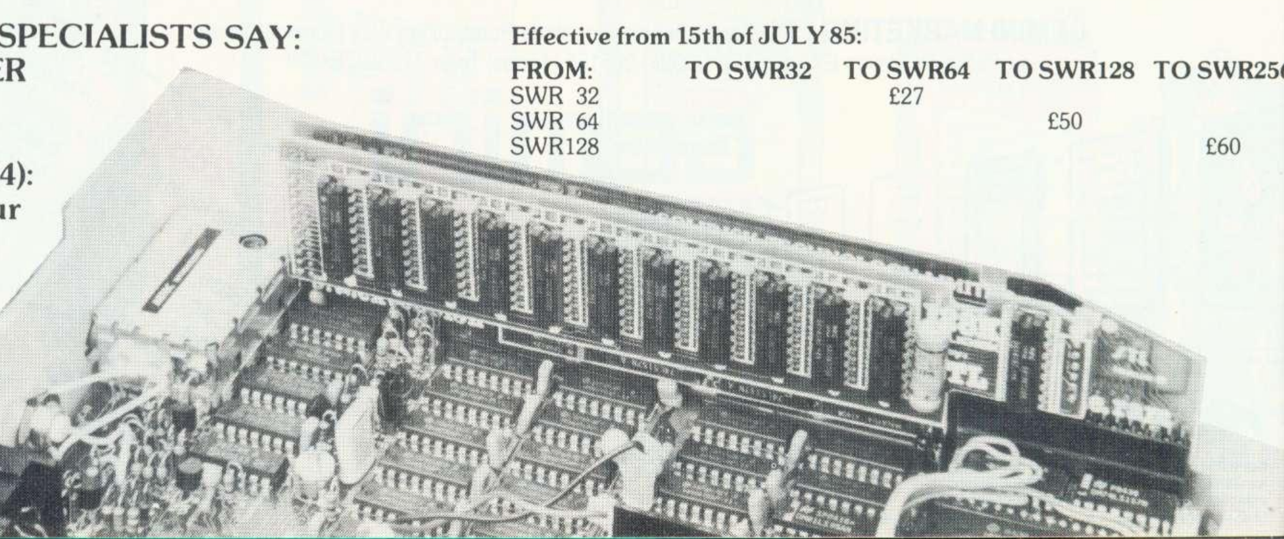
Megagame Packs:
Around 70 games are currently under compilation.

SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (10 lines).

WHAT THE SPECIALISTS SAY:
ACORN USER (JAN 84): 'Exciting . . .'
PCN (MAY 84): 'Power to your BEEB'
A&B: 'Break the RAM barrier'

Effective from 15th of JULY 85:

FROM:	TO SWR32	TO SWR64	TO SWR128	TO SWR256
SWR 32		£27		
SWR 64			£50	
SWR128				£60



You Only Fit Disks Once. Fit the Best.

The SOLIDISK Double Density DFS is now the ultimate in reliability with a minimum component count and excellent software. The DDFS consists of only 4 components to be plugged in to the BBC Microcomputer and can be fitted in just a few minutes by novice and expert alike. It can now run all Acornsoft games (such as Elite, Aviator, Revs, Magic Mushrooms etc. . .) and most other protected discs (Castle Quest, Island's Music system etc. . .)

SOLIDISK relies on a good product and a large support network to win the heart of the user.

With over 75 local experts, covering England, Scotland and Wales, a SOLIDISK National User Group in Holland and soon in Australia, SOLIDISK can offer many users regional free fitting and advice. Also with an ever increasing catalogue of free software, available to all SOLIDISK users.

Even users who are new to the Disc System can expect to build up a large disc program library in a fairly short time.

Solidisk Software Support Service now has a responsibility for over 50,000 users and the ability to give you the best possible support matched only by the largest companies.

WHICH DFS DO YOU NEED?

SOLIDISK produce no less than three types of Disc Filing Systems to cover all your requirements.

1. THE FLEXIBLE DDFS

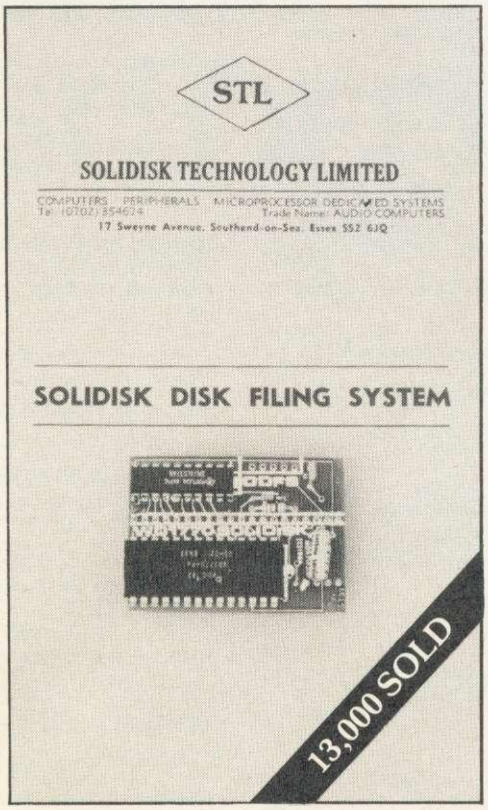
The basic SOLIDISK DDFS is suitable for all ordinary users.

The 1.9 ROM handles both single and double density formats, with built in disc formatter and verifier, along with such features as automatic density sensing and 40/80 track software controlled switching. The disc speed is programmable by the keyboard links to suit almost any type of disc drive.

The 1.9 ROM supports also file size up to disc size.

PRICE

The STL DDFS with 1.9 ROM £40.00
The STL DDFS with 2.0 ROM £45.00
The STL DDFS with 2.1 ADFS £55.00



2. THE DFDC TO UPGRADE ACORD DFS:

Ideally suitable if you already have an Acorn DFS. The DFDC will not only add Double Density capability but also improve the speed of your 8271 chip.

The SOLIDISC DFDC (Dual Floppy Disc Controllers) is making a very large impact on the BBC user community with its versatility.

The DFDC board simply sits in the place of the 8271 FDC chip (i.c. 78) in the BBC. The 8271 is then inserted into the DFDC board and the ROM 2.0 inserted in place of the original DFS ROM.

Once the machine is up and running it is then simplicity itself to change FDC's; just throw the switch attached to the DFDC board, press BREAK and the other FDC is now selected.

PRICE

The STL DFDC with 2.0 ROM £55.00
The STL DFDC with 2.1 ADFS £65.00

THE SOLIDISK WINCHESTER DISC SYSTEM (XD20-40)

This most powerful Winchester system for the BBC computer to date plugs straight into the 1Mhz bus in a few seconds.

Based around the WD1002 SHD controller, Mitsubishi Winchester drive, Astec PSU and the Solidisk ADFS 2.1, it offers 20 Megabytes (26 MB unformatted) and can easily be upgraded to a theoretical maximum of 1300 Gigabytes.

Its phenomenal capacity, huge potential and excellent features make the most expensive Winchester systems look green.

On the technical side, it has very fast seek and an exceptionally low skew factor of 11 (meaning 3 sectors are read or written in one single revolution). It gets ready very quickly too, needing only a few seconds from power up.

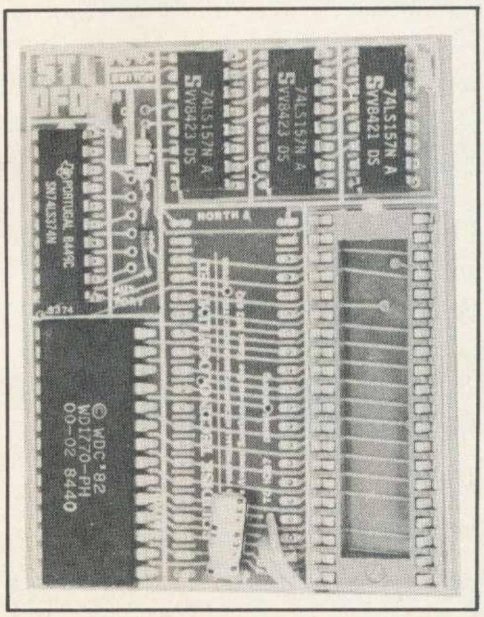
Unlike many other sources of Winchester disc drives, Solidisk Winchester system is properly driven by the Solidisk ADFS 2.1 ROM, compatible with Acorn Winchester specifications and with Acornsoft View, Viewsheet and Viewstore database.

It also runs Gemini's Datagem and Acorn second processors.

It has nice features such as read after write, Password protection, Automatic Winchester to Winchester and Winchester to floppies Backup facilities and a fantastic average file transfer speed of 64k bytes per second.

PRICE:

20 MB Winchester (excluding VAT) £700.00
30 MB Winchester (excluding VAT) £900.00
40 MB Winchester (excluding VAT) ..£1100.00
60 MB Winchester (excluding VAT) ..£1300.00



SOLIDISK TECHNOLOGY LIMITED
17 SWEYNE AVE, SOUTHEND-ON-SEA,
ESSEX SS2 6JQ
TEL. SOUTHEND (0702) 354674 (10 lines)

YOU SHOULD KNOW ABOUT ADFS AND USE IT

ANNOUNCING THE SOLIDISK ADFS 2.1

What is important on a Disc Filing System is how effectively it uses the disc, how fast it loads the programs, how many entries are on the disc and how big they are.

The old BBC DFS leaves most 80 track discs half empty on side 0 and wastes side 2 of most double sided discs.

The new ADFS treats side 0 and side two (if available) as a single disc and uses them to the full.

The old BBC DFS uses single density, the ADFS double density which is twice as fast and stores twice as much.

The old BBC DFS can only handle 31 files of less than 256k bytes in size.

The ADFS can handle thousands of files, up to 600 Gigabytes in size!

If you are afraid that the ADFS is complicated to learn, don't be put off. It isn't complicated at all.

Most of the commands are the same in both systems and the ADFS ones are very much intuitive.

If you know the BBC DFS, a few hours are all you need to master the new ADFS.

You won't regret it. After all, each ADFS disc saves you £2.00 or more on media cost, and the ADFS ROM will pay for itself in a few days.

The Solidisk Advanced Disk Filing System for the BBC computer is now available for both Solidisk DFS and Acorn BBC Plus users.

This massive piece of software is supplied on two 16k ROMs for the BBC B computers or on a 32k ROM for the BBC Plus computers. It supports both the old BBC DFS and the Acorn ADFS. It also provides the users with 20 extra disc utilities.

Standard features for both implementations include:

1) Automatic Write Error Correction.
Every disk write operation is automatically followed by a read operation to ensure that the recorded data is free of all errors. Then if need be, the STL ADFS 2.1 will restart the write operation from the unsafe sector.

2) Automatic 40/80 track stepping.
The STL ADFS will let you read and write 40 track discs on an 80 track drive and copy over from any format to any other format.

3) Disc repair facilities.
Disc sector editor (*DZAP), memory editor (*MZAP), recover good sectors (*RECOVER), rewrite multiple sectors (*RESTORE), read bad sectors and bad track (*RTRACK), repair and restore bad sectors and track (*WTRACK) and the powerful disc copy (*DCOPY) which is capable of duplicating even some non BBC discs.

4) Tape to disc facilities.
Direct transfer from tapes to disc (*TAPEDISC) will work with all unprotected programs. *TAPELOAD and *TAPESAVE will cope with more difficult ones. Only in some cases (multipart games cassettes) will you need Solidisk tape copier.

5) Wordprocessing facilities.
This facility allows !BOOT and other text files to be edited, saved and printed in any screen mode.

6) automatic disc sensing.
On Shift Break, the STL ADFS will automatically detect the disc format and use the right disc filing system to run it.

Special features for the ADFS implementation:

1) Disc formatting facilities.
*FORM40, *FORM80, *FORM160 and *WFORM (for the Winchester) allow you to format ADFS discs in any drive.

2) Disc verifying facilities.
*VERIFY will check all disc sizes including Winchester for media defects.

3) Number of opened channels.
This is one of the star features of Solidisk ADFS.

This facility (*OPEN) allows you to specify how many files will be opened in a program, thus maximising the available RAM while avoiding buffer page swapping as in the Acorn ADFS.

It leaves PAGE at &1900 for most programs, gives extra memory to View and Viewsheet and also avoids unnecessary conversion work on programs originated for the BBC DFS.

Special features for the BBC DFS implementation.

Solidisk ADFS 2.1 handles both single and double density. In addition, it supports:

1) Unlimited catalogue entries (up to disc capacity) without any preparation.

2) Unlimited filesize.

3) Automatic media detection.

8) PRICE

2.1 ROM set	£20.00
Upgrade from 1.9	£15.00
Upgrade from 2.0	£10.00

SOLIDISK KEYBOARD AND CPU

ARE NOT JUST PRETTY . . .

The keyboard is 12 mm lower than the normal BBC case, 2-3 degrees more angled, weighs only 5lbs, does not skid about on the desk while enjoying 2 feet of freedom from the computer unit — and makes a lot of difference to typists (even 2 fingered ones!).

The CPU accommodates 2 disk drives and withstands any heavy weight monitor while providing easy attachment for the whole system, CPU and disk drives, to the desk if need be. Good ventilation to the power supply too and hides all untidy cables away.



PRICE

The complete CPU and keyboard case costs £30.000 inclusive + £3.00 post and packing. The system could be yours free as part of the Mitsubishi twin discs offer.

SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (10 lines).

SOLIDISK MITSUBISHI DISC OFFER

A Complete Disc System containing everything you need, including 1 Blank Diskette, at a new low price of only £199.00 inclusive.

The Mitsubishi Offer Comprises:

— One Mitsubishi MF4853, Double Sided, 80 Track Disc Drive. Cased in beige with all leads.
— One Solidisk DDFS complete Disc Upgrade with 2.0 ROM.
— 1 Verbatim MD525 Blank Diskette.
— 1 Software Pack and User Manuals.
— Full one year guarantee.

PRICE: 200.00.

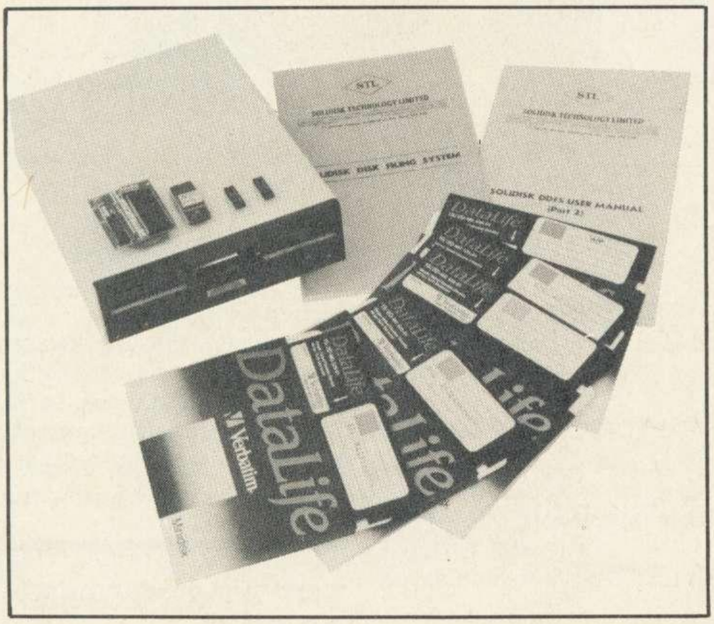
HARDWARE:
As described earlier as shown opposite.

THE SOFTWARE:
The software comprises 5 diskettes, formatted in 80 tracks.

Volume 1:
Solidisk Word Processor and Spelling checker with English dictionary. Easier than View, Wordwise or Scribe, you enter the WP by *WP filename , then start typing. What you see on the screen will be exactly printed on paper.
Most useful commands are all displayed on the top part of the screen.
It features 80 column screen throughout with direct on screen justification, automatic margins, page numbering, Wordstar like editing commands for block move, block delete, block copy, print, save, load text to cursor, insert and overwrite, search and replace, total word count, word frequency count, free space, *commands etc. Solidisk WP loads and saves texts in under 1 second flat and also you may save the edited version as many times and under any filename you like.

It has the unusual ability to spellcheck your document without leaving it, simply by typing in Control-U.

It has self dictionary generating capability too. You may create any dictionary you like by just simply entering the words.



Solidisk WP is also excellent as secretarial training for Wordstar.

Volume 2:
Volume 2 contains Solidisk Database. It is a random access system, completely menu driven and easily customised to suit any particular filing need.

It features unlimited filesize and number of records, supports all maths functions and 80 column screen throughout.

It is simple to understand and to use. You take one of the 15 different options to start. Each option will then lead to a new menu and so on. Mostly you only have to enter an appropriate data or hit the RETURN key.

You can design new databases list all records, edit them, merge them, split them, making mailshot with Solidisk WP etc. . . We use it to process all your orders.

Volume 3:
Volume 3 contains Solidisk Spreadsheet. Menu driven with standard options to create, edit, recalculate, print, search, sort, report generator and mailmerge.
Unlimited number of rows and columns. Each column can be as small as 2 or as big as 70 characters. All math functions are supported. Complete with home banking and simple portfolio management.

Volume 4:
Volume 4 contains the Solidisk tape to disc program and a selection of computer games.

Volume 5:
Volume 5 contains MBASIC, SIGEN and other disc utilities.

IMPORTANT:

If you upgrade to a twin Mitsubishi disc system, Solidisk will offer you, subject to stock availability, a completely free set of CPU and keyboard case as shown earlier.

You should return your disc drive with payment for another Mitsubishi MF4853 (£160.00) or alternatively, save by ordering right now a Fantastic Offer at only £340.00.

SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (10 lines).

SOLIDISK EFS COMBINES DISC
AND A SOCKET FOR THE W

Solidisk Double Density DFS is now the ultimate in reliability and supported by the largest amount of software available for the Electron.
Solidisk relies on a good product and a large support network to win the heart of the user.
With over 75 Local Experts, covering England, Scotland and Wales, Solidisk can offer many users regional free fitting and advice.
With an ever increasing catalogue of free software, even users who are new to the Disc system can expect to build up a large library in a fairly short time.
Solidisk Software Support Service already has responsibility for over 50,000 BBC computer users and the ability to give you the best service matched only by the largest companies.
Solidisk Double Density DFS handles both BBC Discs and Electron Discs, in single and double density whereas the Acorn's PLUS 3 can only handle ADFS discs.
Solidisk ADFS has nice features such as automatic disc format sensing, built-in disc formatter and verifier and programmable disc speed.
It also has more than 20 disc utilities built into the ROM.
Standard features for both BBC DFS and ELECTRON ADFS implementations include:

1) Automatic Write Error Correction.
2) Automatic 40/80 track stepping, the ADFS 2.1 will let you read and write 40 trak discs if you have an 80 track drive.
3) Disc repair facilities.
Disc sector editor (*DZAP), memory editor (*MZAP), recover good sectors (*RECOVER) rewrite multiple sectors (*RESTORE), read bad sectors and bad track (*RTRACK), repair and restore bad sectors and track (*WTRACK) and the powerful disc copy (*DCOPY) which is capable of duplicating even some non BBC discs.
4) Tape to disc facilities.
Direct transfer from tapes to disc (*TAPEDISC) will work with all unprotected programs. *TAPELOAD and *TAPESAVE will cope with more difficult ones. Only in some cases (multipart games cassettes) will you need Solidisk tape copier.
5) Wordprocessing facilities.
This facility allows *BOOT and other text tiles to be edited, saved and printed in any screen mode.
6) Automatic disc format sensing.
On Shift-Break, the STL ADFS 2.1 will detect the disc format and use the right BBC DFS or Electron ADFS to run.

On the Electron ADFS side, the 2.1 ROM also has some very nice features:

1) Extensive Disc formatting facilities.
*FORM40, *FORM80, *FORM160 and *WFORM (for the Winchester) are available to handle any disc drive.
2) Disc verifying facilities.
*VERIFIFY will check all disc sizes including Winchester for media defects.
3) Number of opened channels.
This is the star feature of Solidisk ADFS.
This facility (*OPEN) allows you to specify how many files will be opened in a program, thus maximising the available RAM while avoiding buffer page swapping as on the Acorn ADFS.
It leaves PAGE at &1900 for most programs, gives more room to View and Viewsheet and avoids unnecessary conversion work for many programs originated for the BBC DFS to be run on your Electron.

On the BBC DFS side, the STL ADFS 2.1 handles both single and double density and in addition, it supports:

1) Unlimited catalogue entries.
2) Unlimited filesize.



THE SOLIDISK 16k SIDEWAYS RAM:

Solidisk Sideways RAM is an almost indispensible add-on for the Electron with disc drives.
The Sideways RAM occupies the same memory area as the BASIC or ADFS ROM in the micro's memory map. This means that Sideways RAM can run almost any ROM type software, including languages, utilities and games.
Sideways RAM is notably invaluable to run games and specially "MEGAGAMES".
Games and programs run at 2MHz clock speed in Sideways RAM, if loaded into the Electron RAM, they can only run at 1MHz clock speed, ie half the speed of Sideways based games.
Megagames are too large to be run on the unexpanded Electron. They use extensively 8 colour high resolution screen (mode 2), background music, sound and high speed sprites.
Solidisk supply free software to maximise the use of Sideways RAM on the Electron. These include Wordprocessor, Spreadsheet, Database, Toolkit, Machine Code Monitor, Printer Buffer, Sprites, Playtunes, Virtual Memory Processor, VDU Replay, Screen Effects, digitised pictures etc . . .

THE WINCHESTER SOCKET:

Solidisk has the most powerful Winchester system for the BBC computers and the Electron. The Winchester system can provide from 20 Megabytes to a theoretically possible 1300 Gigabytes of storage, directly on line with the Electron.
The same Winchester unit can be used on the BBC B, the BBC PLUS and the Electron without any change.
You can read more about it in BBC Micro User or in Acorn User Magazines. Price of a 20 Megabytes system is only £700.00+VAT (£805.00).

SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (10 lines).

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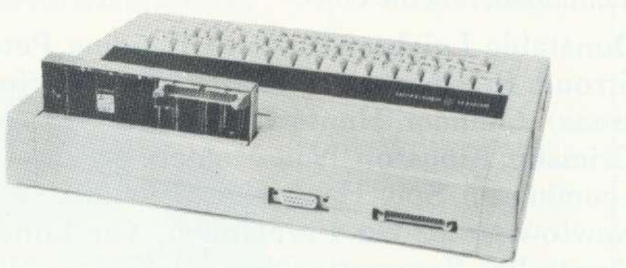
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This compact 32K buffer can be fitted internally on any EPSON printer within a few minutes. It does not require external power or any modification to the printer. It will hold about 15 A4 pages of text freeing your computer for other jobs in a fraction of the time it would normally have to wait for the printer to finish all that printing. Supplied with full fitting instructions. £99(d)

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BROTHER HR15: • 14 cps • 3K Buffer • Two colour printing • Proportional spacing * Underline * * Bold * Shadow print * Super/Sub script + many other features.

BROTHER HR15 £325(a)

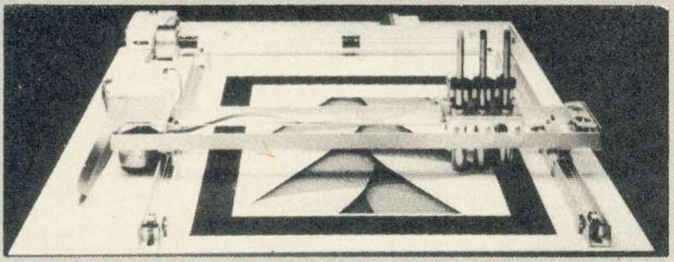
JUKI 6100: • 15 cps • 2K Buffer • Switchable 10/12/15 cpi • Proportional printing • Linear Motor for max reliability.

JUKI 6100 £325(a)

GRAPHICS PLOTTER/WORK STATION

Equally at home in the artists studio, hobbyists workshop, science lab or a classroom, this system has something to offer for everyone. The 3 colour graphics plotter provides both precision and versatility. The carriage can be moved with an accuracy of 0.025cm over an A4 area — the plotter being able to accept paper and far thicker materials at sizes of up to A3. The basic plotter carries 3 colour pens each of which is software selectable. Additional accessories greatly enhance the versatility of the unit without losing the accuracy. The servo controlled drill/router, and scriber can be used on various materials. A unique Opto Sensor (using a Hewlett Packard device) turns the plotter into a high-res scanning digitiser to read & store whole diagrams and photographs. Workstation comes complete with all accessories.

Workstation Complete £490(a)



Basic Plotter £270(a)

Opto Sensor £72(c) Drill/Router Attachment £79(c)
Power Supply: PS12V £42(c) PS24V £78(c)
Scandump Utility Disc £14.95 (d)

TECHNOMATIC

All prices exclude VAT

PRINTER ACCESSORIES

EPSON
Paper Roll Holder £17(d) FX80 Tractor Attachment £37(c).
Interfaces: 8143 RS232 £28(c); 8148 RS232 + 2K £57(c);
8132 Apple II £60(c); 8165 IEEE + Cable £65(c).
Serial & Parallel Interfaces with larger buffers available.
Ribbons: RX/FX/MX80 £5.00(d); RX/FX/MX 100 £10(d);
FX80 Dustcover £4.50(d); LX80 Tractor Unit £20(c);
Spare pens for HI80 £7.50/set (d)

KAGA TAXAN: RS 232 Interface + 2K buffer £78(c); Ribbon KP810/910 £6(d)

JUKI: RS232 Interface £65(c); Spare Daisy Wheel £14(d); Ribbon £2.50(d); Sheet Feeder £182(a) Tractor Feed Attach £129(a)

BROTHER HR15: Sheet Feeder £189(a) **Ribbons Carbon or Nylon** £4.50(d)

BBC Printer Lead: Parallel (42") £7(d); Serial £7(d)
Printer Leads can be supplied to any other length.

Plain Fanfold Paper with extra fine perforation (Clean Edge):
2000 sheets 9.5" × 11" £13(b) 2000 sheets 14.5" × 11" £18.50(b)
Labels per 1000s: Single Row 3½" × 1 7/16" £5.25(d)
Triple Row 2-7/16" × 1 7/16" £5.00(d)

EPSON HI-80 PLOTTER

EPSON technology has once again scored a first by introducing a sophisticated A4 size plotter that does not need specialised software or programming skills to operate it and yet keep the cost within the reaches of all computer users. Features include 4 pens at a time — upto 10 colours to choose from, a variety of pen nibs, high speed plotting. Powerful software command codes include single commands to plot circles, ellipses or triangles. Line or bar graphs and pie charts can be plotted in a variety of exciting styles very simply by keying in the data into the computer. Detailed leaflet on request. £399 (a)

PRINTER SHARER/BUFFER

A unique sharer/buffer that provides a simple solution to improve system utilisation. It can be connected to up to three computers and it will automatically switch between the computers to scan for data — no manual switching required. High speed data input rate to the buffer cuts down the normal waiting time for the computers for the printing operation to complete and thus allowing the computers to be used for other uses. The 64K buffer would hold over 30 A4 pages of text.

Facilities include: COPY, PAUSE AND RESET. LED indication for percentage of memory available and data source. Mains powered. Send for detailed specification.

TSB 64 Buffer/Sharer £199 (a)
BBC Cable Set £30

PERIPHERAL & COMPUTER SHARERS

We now offer an extended range of peripheral sharers to allow the user to switch between computers, printers and modems. High quality switching mechanisms housed in fully shielded metal cases ensure reliability. No external power input required.

All lines on the sharers are fully switched (36 on parallel and 25 on serial)

	Parallel	Serial
3 Computers to a Printer	36V36-3 £69(c)	25V25-3 £64(c)
4 Computers to a Printer	36V36-4 £85(c)	25V25-4 £74(c)
2 Computers/2 Printers X-over	36V36-X £69(c)	25V25-X £69(c)
BBC Cable Set 3 to 1 (1m ea.)	£32(c)	£34(c)
BBC Cable Set 4 to 1 (1m ea.)	£39(c)	£41(c)

Computer Sharer:
1 computer to 2 printers fitted with Cable for BBC TCS26 £19.50(c).

GRAFPAD

A low cost graphic tablet offering the performance & durability required by industrial and educational users. It is compact, accurate & reliable; working area 240 × 192mm + menu area. Comes complete with a CAD package. £110(b). DDX software £99(b)

RH Light Pen. Now only £29 (d)

17 Burnley Road, London NW10 1ED
Telephone: 01-208 1177. Telex: 922800
All Carriage Code (a) deliveries by DATAPOST guaranteed for delivery next working day.

COMMUNICATIONS

MODEMS

BUZZ BOX A full spec, BT approved, pocket size, direct connect modem with both originate & answer modes, full & half duplex, allowing access to many databases, bulletin-boards as well as intercomputer communications. It conforms to CCITT V21 300/300 Baud Standard. Battery/mains powered **£62(c)** BBC Lead **£6** External PSU **£9(c)**

MINOR MIRACLES WS2000 A world standard modem, having BT approval, covering V21, V23, (BELL 103/113/108 outside the UK) and including 75,300,600, 1200 Baud ratings. What possibly gives this modem its biggest advantage is its option of computer control. A 25Way RS232 input as well as possible computer controlled auto/dial/auto-answer makes this modem unique. WS2000 **£129(c)** BBC Serial Cable **£7.**



WS2000 Auto-Dial card: includes an integral loudspeaker for monitoring of the phone line **£30(d).**
BBC User Port cable (for modem control) **£7.**
SKI KIT (Allowing total control of the modem by your computer) **£10.**
DS1 Disc (for Commstar): When used with the Auto-dial card, SK1 Kit, and a user port cable, this software will dial out to Prestel, enter your password etc. and leave you in Commstar. Will also store many bulletin board telephone numbers for autodialling **£10.**
WS2000 Auto-Answer Card £30(d).
(Please note that the A/D & A/A Cards are still awaiting BABT Approval.)

DATA-BEEB An advanced communication ROM from Miracle Technology. Its many features include both Viewdata (Prestel) and Terminal modes, Auto-Answer and Auto-dial for fully expanded WS 2000's etc. **£25(d)**

NEW WS 3000 A new range of modems featuring 'Hayes' protocols. 1200/1200, 2400/2400, 4800/4800 bauds full duplex, auto answer, auto-dial, data security option etc. Please phone for details.

COMMSTAR An ideal communications Rom. Extremely easy to use, yet very versatile. It features both a Prestel mode as well as a Terminal mode, thus offering very good value for money. In Prestel mode, all normal Prestel features are available including, downloading of software, saving and retrieving of pages on disc, page tag, revealing of hidden text etc. Its terminal mode is ideal for bulletin boards etc. Any type of file, (not just ASCII) may be sent using XModem protocols. Even includes an elapsed time clock. **£29(d)**

TERMI-II A good general purpose communications package for bulletin boards, electronic mail etc. (Not for PRESTEL) **£28(d)**

COMMUNICATOR This is a full 80 col VT100 terminal emulation program on 16K eprom. It is a more advanced program than TERMI and features easy to follow screen menus. The rate at which data is sent or received is easily set up with rates up to 19200 Baud with 80 column text. Allows files to be transmitted from disc, or a copy of incoming data to be sent to a file or to a printer. (Communicator is not suitable for PRESTEL). **£59(d).**

'TIME-WARP' REAL-TIME CLOCK CALENDER

We have broken the price barrier! A low cost unit, allowing the facilities of units costing far more. Built to professional standards, it opens up the total spectrum of Real-Time applications. Possibilities include desk diary/planner, calender, continuous display of on-screen time and date information, automatic document dating, precise timing and control in scientific applications — its uses are endless. Simply plugs into the user port — battery backup is supplied as standard. A full manual as well as Extensive software on cassette (easily transferred to disc) — no ROMs needed. **£29(c)**



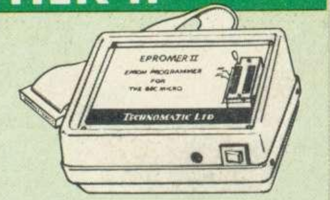
SMARTMOUTH

The original 'infinite speech' synthesiser. A ready built, self contained speech synthesiser unit attractively packaged with a built in speaker. Plugs into the user port. **£31(c)**

TECHNOMATIC

All prices exclude VAT

EPROMER II



A sophisticated eprom programmer that handles the full range of popular single rail eproms (incl 27256) and allows the user full control of the programming process.

Its powerful menu driven software makes the programming of eproms simple, efficient and eliminates the need to have fiddly switches for selecting eprom types, programming voltage or method. The features include:

* Integral power supply ensures no power drain from the computer.
* Interfaces through 1 MHz bus, fully buffered.
* Clear and simple instructions displayed on the screen make the programming easy for both the first time user and the advanced user.
* Eproms upto 16K (27128) programmed in single pass.
* Selectable programming voltage 25/21/12.5V
* Selectable programming method — normal or high speed algorithmic. High speed programming enables 27128 to be programmed in just over 2 mins. Normal programming skips addresses with FF data to increase programming speed. Automatic verification on completion of programming.
* User can select any section of the eprom from a single byte to its full address range to Blank Check/Read/Program/Verify enabling program development/changes very simple.
* Full screen editor with HEX/ASCII input.
* Full tape/disc filing facility. Data input from keyboard/Tape/Disc/Eprom.
* Constant display of all options selected.
* Several BBC BASIC programs can be entered on a single eprom.
* Checksum facility allows for easy identification of programmed roms.

EPROMER II with Manual & Cassette **£99(b)** Software on disc **£3**
ROM based software **£10**

UV ERASERS

UVT1T Eraser with built-in timer and mains indicator. Built-in safety interlock to avoid accidental exposure to the harmful UV rays. It can handle up to 5 eproms at a time with an average erasing time of about 20 mins. **£59(b).**
UV1T as above but without the timer. **£47(b).**

ROM/RAM EXPANSION SYSTEMS

COMPUTER VILLAGE ROM/RAM BOARD: A beautifully designed expansion board, simply plugs in — no soldering. (Fits into 6502 and Video ULA Skt.). Fully buffered with 16 paged Rom capacity. Option of 16K paged Ram, with software initiated write protect — battery backup is included. It allows nine different ROM/RAM configurations. **£43(c)**

ATPL SIDEWISE ROM EXPANSION BOARD: A well constructed expansion board, simple to instal and requires no soldering. All buses are buffered. It allows full sideways rom expansion to 16 ROMs. One socket has been split into two 8K sockets to allow the use of 8K CMOS RAM. Battery backup option allows data retention in the RAM when the computer is switched off. Several link selectable options including write protect for the RAM. ATPL Board **£39 (d)** Battery Backup Kit **£18 (d).**

RAMROM-15: The advanced sideways ROM/RAM expansion system. This is an external unit, using high quality construction, attractively packaged in a BBC coloured metal case, allowing easy access to all the sockets. (Allows other units to be fitted inside the BBC). Absolutely no soldering is required. Allows 11/12 additional sideways ROMs to be fitted with an option of up to 16K sideways RAM. All commonly available RAM can be used i.e. 4801/6116/6264 or xx128. All the hardware to take the RAM is already fitted e.g. battery backup. For development work and further expansion, most of the 6502 processor signals are available. Supplied with utility disc and full instruction manual. **£86(b).**

ARIES B-12 Board £40 (d) **ARIES B-20 Board £78 (d)**

17 Burnley Road, London NW10 1ED
Telephone: 01-208 1177. Telex: 922800
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Techno-Line 24HR VIEWDATA SERVICE
Tel: 01-450 9764

01-208 1177

Please add carriage: (a) £8; (b) £2.50; (c) £1.50; (d) £1 and VAT at 15% to order. Carriage (a) sent by Datapost

RB2 TRACKER BALL

A precision built tracker ball. Software allows RB2 to function, instead of cursor keys, for word processing, CAD/CAM etc. Software includes a graphics/CAD package.

RB-2 (with 'microdraw'). £52 (b)
RB-2I (with 'icon artmaster'). £60 (b)

AMX MOUSE

This sophisticated mouse has many advanced features such as Icons, Windows etc. The supplied 'AMX ART' is a superb, yet simple-to-use CAD package allowing the creation of amazing graphical designs. A screendump for drawings is included. It can also be used with Wordwise/View to replace the cursor keys. Supplied complete with CAD Package, ROM and full instruction manual. £69 (b)

AMX DESK — An organisational program, including memo-pad, telephone/address book, diary, alarm, calculator etc. On Disc. £22(d)

AMX UTILITIES — provides new drawing facilities including Zoom, colour sketch and more. On Disc. £13(d)

ACORN TELETEXT ADAPTOR £192(a)

ACORN IEEE INTERFACE

This interfaces enables a BBC computer to control any scientific and technical equipment that conforms to the IEEE488 standard, at a lower price than other systems, but without sacrificing any aspect of the standard. The interface can link up to 14 IEEE compatible devices. Typical applications are in experimental work in academic and industrial laboratories, with the advantage of speed, accuracy and repeatability. The interface is mains powered and comes with cables, IEEEFS ROM, and user guide. £282(a)

ACORN MUSIC 500

Convert your BBC micro into a sophisticated music composition aid and sound effects generator. Custom made software will provide you with the flexibility to compose, experiment, perform and teach music. Stereo output can be connected to a sound system including your home stereo unit. Full specification on request. £174(a)

DATABASE MANAGEMENT SYSTEMS

The system includes a carrier board containing two Eproms, demonstration applications disc in both 40/80T, professional documentation with quick reference card, and 'Trans' utility program. Features include • almost unlimited file size (max 10Mbyte) • supports up to 4 drives • Max of 5000 records per file • max 6K record size • max of 62 fields • 9 level hierarchical search system with facilities to store results of searches. • User defined variables • generates form letters from records.
Please ask for leaflet. £99(c)

STARdataBASE: A fast machine code, true random access database program in a 16K Eprom. Up to 4096 records in a file, up to 69 fields in a record. The record layout is totally user defined. Entirely menu driven — thus very user friendly. Extremely fast searches are possible using the Keysearch facility. Mailmerging from View and Wordwise, and address labelling. Its printer configuration suits any BBC compatible printer. £69(d)

NEW

VIEWSTORE: An exciting, powerful database with many features: Display can be 'spreadsheet' or 'card-layout' type. Powerful selection and sorting utilities. Any screen mode can be used. Data can be sent to View and ViewSheet. Maximum file size 4096MByte!. Maximum record size 60K. £52(c)

CP/M SOFTWARE FOR TORCH Z80 ACORN Z80 PROCESSOR

We can now supply almost any CP/M based software package in a format suitable for the Torch Z80 and Acorn Z80 second processors.

WORDSTAR PROFESSIONAL: The advanced word processing package comprising of WordStar, MailMerge, StarIndex and SpellStar, a total combination offering substantial savings on individual prices. WordStar is the best selling word processing program on the market. Extensive operator aids include a comprehensive yet friendly manual, step-by-step training guide, command cards, on-screen menus with four levels of help messages etc. etc. SpellStar checks text files against its 20,000 word-plus dictionary. You can both add to the dictionary and create specific supplementary ones. Mailmerge is ideal for mailing applications where lists are selected on a range of criteria. It enables the fast production of personalised form letters, mailing labels, invoices, etc. StarIndex creates alphabetical indexes, tables of contents, paragraph numbering and much more.

WORDSTAR PROFESSIONAL £310(a)
WORDSTAR £275(a) MAILMERGE £145(a)

DBase-II: Undoubtedly 'The Database', can be used for an almost limitless number of business applications, ranging from mailing list preparation and maintenance through to running accounting ledgers and payrolls. In addition to standard database features it provides much more. An on-disc tutorial takes you from setting up a simple file all the way through to setting up custom screens and reports. Automatic calculations may be performed on data, and fields or entire databases may be modified or replaced with single, English-like basic commands; Dbase-II can therefore be used by general personnel having no programming knowledge. It can be tailored to suit a variety of professions and individual needs, with files such as accounting, payroll, time billing, job costing, scheduling and mailing lists. It can access several files at a time. It is fast, flexible and powerful. £335(a)

FRIDAY! is a file management system designed for the new comers to the computer field. It handles mailing lists, invoices, salary cheques, sales and inventory screens, and reports. Use of plain English and specially devised menu system makes it very simple to use.
FRIDAY! reads and writes dBASE II files and standard ASCII files. £175(a)

SuperCalc-2: A powerful decision making tool which helps to solve complex 'What if...' financial modelling and forecasting questions. With a working area of 63 columns and 255 rows, Supercalc 2 takes full advantage of colour and full memory. It allows consolidation of different spreadsheet files, sorting, a wide choice of formats. Full documentation with easy to follow lessons and single key commands make the use of Supercalc2 very easy. Separate windows provide for display of results and formulae simultaneously. Calendar and date calculations simplify calculations on loan repayment and periods. £180 (a)

Pro-Pascal: A full implementation of the International Standard for Pascal (ISO 7185) apart from the optional conformant parameters feature. In addition to the standard features of Pascal, Pro Pascal includes: dynamic strings for character and string manipulation, 9 digit integers and random access file handling for data processing applications, single and double precision floating point arithmetic, an assembler level interface for systems programmers, and separate compilation of program segments for building libraries of commonly used procedures and enabling very large object programs to be constructed. Pro Pascal is a 3 pass compiler, converting a source program into efficient Z80 machine code. The package includes a compiler, run-time library, link editor, library manager and cross referencing utility. £220(a)

BSTAM: A telecommunication facility used for transmitting any size CP/M file. £165(b)

Other packages available include CIS-COBOL, INFOSTAR, FRIDAY, DMS +, FMS, SAGE, ATI TUTORIALS, MACRO-80 etc. Please telephone with your requirements.

TORCH GRADUATE SOFTWARE

We are able to supply most popular software packages including: FRAMEWORK, WORDSTAR, WORD, EASY-WRITER, DBase-II & III, LOTUS-123, VISICALC, SAGE etc. Please telephone with your requirements.

17 Burnley Road, London NW10 1ED
Telephone: 01-208 1177. Telex: 922800
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Techno-Line 24HR VIEWDATA SERVICE
Tel: 01-450 9764

ROMs/SOFTWARE

VIEW Acorn's new version V2.1 word processor rom. Advantages include printing straight from memory and editing in any mode. £48(c)

HI VIEW Disc based version of VIEW word processor for use with the 6502 2nd processor. Allows 47K of user memory. £52(c)

VIEW INDEX Disc based program to create an index from VIEW text files. Ideal for anyone concerned with writing extensive reports or books. £13(d)

WORDWISE: One of the most popular word processors for general use £34(d). Wordwise SpellCheck Disc — A must for any serious word processor user. Normal price **£16.50(d).** If bought with Wordwise: No p&p and only **£14.**

WORDWISE PLUS: The new advanced Wordwise on a 16K eprom, for the more specialised users who require added features and flexibility. New facilities include: 2nd Processor compatible allowing 80 column previewing in all cases, a new Basic-like language, new editing features and embedded commands etc etc. Four new programs are also supplied allowing mail-merging, index generating, two-column text printout and continuous processing. A new 56 page introductory manual and a 180 page reference manual complete this rather special package. Finally, it is able to use existing Wordwise files without any modification. £49(d)

SPELLCHECK II: A ROM based fast machine code program that works with both VIEW and WORDWISE. Vocabulary disc supplied with 6000 words can be expanded to well over 17,000 words on 100K drive. Fully compatible with 6502 second processor. £26(d)

6502 DEVELOPMENT PACKAGE: A Macro-Assembler with utilities for use with the 6502 2nd Processor. Enables the serious programmer to develop large programs in assembly language. £43.35 (d)

ISO-PASCAL: Acorn's full implementation of International Standard Pascal on two 16K ROMs. Disc Version for use on 6502 2nd Processor also supplied. Comprehensive manual. £60(c)

OXFORD PASCAL: A fast, compact P-Code compiler, that fully utilises BBC Graphics and sound, contains a powerful editor, and produces 'stand-alone' software. £43(c)

ACORN LOGO: A full implementation of the Logo language from Acornsoft. Supplied as two ROMs with a tutorial course and technical manual. £60(b)

ULTRACALC 2: This enhanced version of the original BBC Publications popular spreadsheet ROM includes many new features including full compatability with the 6502 2nd processor running as HiCalc allowing 44K of user memory, operate in any mode, greater flexibility in printer control, spooling as ASCII file etc. All these features are in addition to the existing powerful features such as handling of labels and numbers as values. Column width control and features normality found in well designed spread-sheets. £50 (d)

INTERSHEET: The new spreadsheet from Computer Concepts. Many advanced facilities including 105 character display, several spreadsheets may be used at once, may be used with View & Wordwise etc. etc. £49(c)

VIEWSHEET: Acorn's spreadsheet provides 255 columns and 255 rows and will operate in any mode. Windows can be created which can then be re-arranged to provide any print format required. Function keys provide for easy entry of commands. Printer control codes can be used using the printer driver. Fully compatible with VIEW and the 6502 2nd Processor. £52(d)

BCPL: A full implementation of the BCPL compiler language consisting of the language ROM, disc containing the BCPL compiler, a screen editor, a 6502 assembler, other utilities and programming aids and examples of BCPL code and a 450 page manual. BCPL can be used to develop games programs, commercial packages, system software, to write control systems and to produce programs which otherwise would need to be written in assembler. £52(b)

BCPL STAND ALONE GENERATOR: Utilities in this package enable the programs developed using the BCPL ROM to be converted so that they can be run on any BBC micro whether it has a BCPL ROM or not. Stand alone programs for other 6502 based systems can also be developed. £43(d)

BCPL CALCULATIONS PACKAGE: Supplied on disc, it supports floating point, fixed point and fast integer calculations. It includes the BCPL calculation files, example files and a comprehensive user guide. £17.30(b)

ACORN LISP Rom £43(d); FORTH £43(d); COMAL £43(d)

COMPUTER CONCEPTS COMPILER: Please phone for availability.

G:FORTH: An advanced implementation of FORTH which follows the 79-Standard specification on a 16K ROM and has a full double number extension set. It incorporates an editor, 6502 assembler, very fast turtle graphics and supports extensive string and file handling. It contains 540 predefined words including those for reading joystick ports, produce sounds, set and read the time and produce random numbers. Fully compatible with disc or tape filing systems and works in any mode. Package comes complete with a USER GUIDE, Introduction to FORTH and 16K GFORTH ROM. £43(d)

DISC DOCTOR: Computer Concept's popular disc utility ROM which adds 20 commands to the DFS system. £27(d)

DISCMASTER: Disc Utility. £16(d)

EXMON-II: Advanced M/C Monitor. £24(d)

TOOLKIT: Adds 27 new commands to BBC Basic. £23(d)

SLEUTH: Basic Debugger £24(d) **GRAPHICS ROM** "*" £27(d)

PRINTMASTER: The ROM that features the most versatile screen dumps for the Epson MX/RX/FX80 and KAGA PRINTERS. Includes mode 7, magnification, character definition, enlarged text, etc. etc — in short — this ROM does it all! £28(d)

DUMPMASTER: Disc based dumps for many printers. £10(d)

MUROM: Music Development ROM. £24(d)

BILLBOARD: A useful program that enables your BBC to produce super-large 'Billboard' type characters i.e. a continuous horizontal scrolling of super-large characters. Supplied in ROM. £16.50(d)

HELP: ROM based comprehensive on screen HELP facility to aid and speed up programming. £21(d)

MICROGUIDE: Keyboard Key-Plate. £16.50(d)

MICROTEXT: The authoring system from the National Physical Laboratory. Disc £53(b) Cassette £43(b)

REPLICA II: 40 & 80 Track Versions available. £10.35(d)

BROM: The new utility ROM from Clares — a Toolkit ROM that gives you full screen editing. Many extra functions are included. £30(d)

BEEBUG DESIGN £16.50(d)

BEEBUG SUPERPLOT Cass £8.50(d)

SPELLCHECK-I £16.50(d)

MASTERFILE II: The new version of the popular general purpose file management system. It allows large amounts of information to be stored and processed. It is extremely powerful yet flexible to use. The disc version allows up to 17 fields per record, and the only limitation as to the number of records is the capacity of the disc. Typically, using 5 fields, about 2000 records may be stored on a 100K disc. This latest version features many new facilities including use with WORDWISE/VIEW £16.50(d) Disc (80 or 40T).

HERSEY CHARACTER: Font generator £12.50(d)

When ordering software on disc please specify track format (40/80)

BOOKS

(No VAT p&p £1.50 per book)

CPU/Assembly Language Books
6502 Applications £12.50
6502 Assy Lang Prog £17.50
6502 M/C for Beginners £ 5.95
6502 Advanced Programming £11.95
6502 Programming £13.95
6800 Prog Reference Manual £ 9.00
6809 Assy Lang Programming £13.45
6809 Programming £12.95
8086 Book £19.50
Prog. the 8086/89 £13.50
68000 Assy Lang Prog £18.95
8087 Applications and Programming (IBM) PC £22.25

LANGUAGES
BBC Micro Sideways Roms Rays £ 9.95
CP/M Handbook £13.95
Mastering the CP/M £16.50
FORTRAN Cookbook £ 8.00
Introduction to PASCAL £16.50
Prog the Micro with PASCAL £ 8.50
The UNIX Book £12.50

BBC Micro Books
Books for Beginners:
Let Your BBC Teach U to Prog £ 2.50
BASIC programming on the BBC — Cryer £ 5.50
BBC BASIC £ 4.00
BBC BASIC for Beginners £ 4.00
BBC Micro for Beginners £ 4.75
Century Computer Prog £ 9.95
Drawing Your Own BBC Programs £ 6.95
Easy Prog for the BBC Micro £ 5.00
Friendly Computer Book £ 3.50
Gateway to Computing BBC1 £ 4.95
Gateway to Computing BBC2 £ 4.95
Getting More from Your BBC & Electron £ 5.95
Introducing the BBC Micro £ 4.50
Step by Step Programming 1 £ 5.95
Step by Step Programming 2 £ 5.95
Mathematical Programs in BBC Basic £7.95

Languages/Programming
30 Hour BASIC £ 6.75
Advanced User Guide £12.50
Adv BASIC Rom User Guide £ 7.50
Advanced M/C Tech for BBC £ 6.50
Advanced Prog Tech for BBC £ 8.50
Assy. Lang. Prog. made easy £ 5.00
Assembly Lang Prog for BBC £ 7.00
Assembly Lang Prog 2nd Ed — Birnbaum £ 8.75
Applied Assembly Lang on BBC £ 7.95
BASIC Rom User Guide £ 9.95
BBC Micro Advanced Programming £9.95
BBC Micro Sideways ROM's RAM's £ 9.95
BBC Rom Book B. Smith £9.95
BBC Micro Revealed £ 2.00
BCPL User Manual Acorn £15.00
Beyond BASIC BBC Publ £10.00
Creative Assembler on BBC £ 5.95
Discovering BBC M/C £ 6.00
Guide to the BBC ROM £ 9.95
Expert Guide James £ 6.50
Exploiting BBC BASIC £ 6.95
FORTH Acorn £ 7.50
Further Programming for BBC £ 4.00
LISP Acorn £ 7.50
Programming the BBC £ 6.50
Structured Programming £ 6.50
S-PASCAL Acorn £ 7.50
Using BBC BASIC £10.00
Word Processing on BBC (Wordwise + Epson) £5.25

SOUND & GRAPHICS:
Advanced Graphics with BBC £ 6.00
BBC Graphics & Sound £ 7.50
BBC Micro BASIC, Sound & Graphics £ 7.50
Creative Graphics Acorn £ 7.50
Graphics on the BBC Micro £ 6.00
Turtle Graphics £ 7.50

EDUCATIONAL:
35 Educational Programs £ 6.00
BBC Micro in Education £ 6.50
Prog for Education (Pri.Sch) £ 5.95

DISC DRIVE SYSTEMS:
Advanced Disc User Guide £12.95
BBC Micro Disc Companion £ 7.95
Disc-Drive Projects for Micro's £ 5.95
Disc Book £ 3.50
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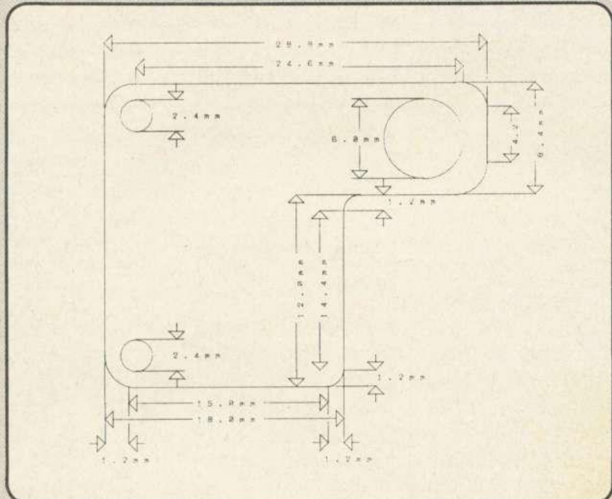
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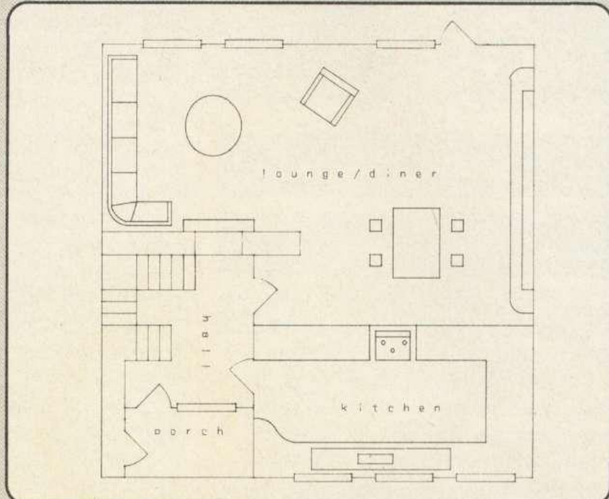
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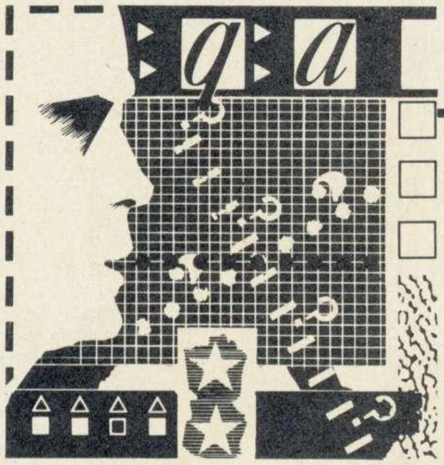
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Martin Phillips introduces this month's main event – a lesson in assembly language and using event-handling routines with sound

Sounds like an event

AMONG the batch of requests I receive every month there are always a couple of letters asking for an article on event-handling. One such letter was from Michael Leete, who wanted to use the event-handling routines with sound.

Events are useful ways of interrupting whatever the computer is doing for a short while and making it do something else. They are not easy to use and cannot be handled through Basic, so you have to use assembly language. As most readers are probably aware by now, I prefer Basic and turn to assembly language only when there is an obvious advantage in its use. There is no alternative here. Readers who have never dabbled in assembly language have to start somewhere!

Events can be used to give some interesting effects and while they don't provide the easiest way of attacking assembly language they can be one of the most useful. It is, of course, not possible to explain the whole subject in a short article, and uninitiated readers are advised to buy a good book on the subject. The two I have found most useful are *Beyond Basic* by Richard Freeman (published by the BBC) and *Assembly Language Programming for the BBC Microcomputer* (second edition) by Ian Birnbaum, published by Macmillan. The latter is the definitive text, whereas *Beyond Basic* provides an introduction with many examples.

Simple assembly language techniques that can be used to produce sound need to be introduced before delving into events themselves. One advantage of assembly language – and often the main reason for its use – is its speed of execution. This is seldom an advantage for sound, where even the shortest note is very long in terms of the speed of operation of the computer, and because of the number of parameters required after a SOUND or ENVELOPE statement, assembly language programming of sound tends to be tedious.

The easiest way to make a sound on the Beeb is using VDU7, or PRINT CHR$(7). This will produce the sort of bleep produced by pressing the CTRL key and 'G' together (CTRL-G). It would be useful to 'tap' into the machine code routine resident in the operating system that actually does the work of programming the sound chip to produce the bleep. Acorn has thoughtfully provided a series of entry points into its operating system ROM so that programmers can use existing machine code routines inside the ROM instead of having to write their own.

One such routine is called OSWRCH (Operating System WRite CHaracter). This 'writes the character given in the accumulator to the currently selected output stream'. That is, the OSWRCH call does the equivalent of a VDU command. The accumulator is one of the six 'registers' in the 6502 microprocessor, the others being the X register, the Y register, the stack, the program counter and the processor status register. The accumulator is the most important register. If the number stored in the accumulator is set to 7 and there is a jump to the OSWRCH subroutine this will perform the equivalent of a CTRL-G.

One area of confusion is that OSWRCH is not actually a command that the Beeb or Electron understands. A delve into the *User Guide* will eventually produce the information that the OSWRCH subroutine starts at memory location &FFEE. This is known as the entry point. Listing 1 shows how assembly language can be used to sound a bleep. This program could be considerably shortened, but it has been programmed using a structure that will be used with later programs.

DEFPROCinitialise simply sets the variable 'oswrch' to have a value of &FFEE. DEFPROCassemble is the procedure to assemble the machine code, starting at location &C00. This could be changed to suit the particular application. Line 160 sets P%, the assembler directive. This tells the assembler where in memory to place the assembled program, in this case starting at location &C00.

The square brackets signal the start and finish of the assembly language part of the program. When the program is run, the assembled part will list on the screen and there will be a bleep. To make it bleep again, type in the line:

```
CALL &C00
```

This program can now be extended to show how events are used. A useful purpose for the event handler is to make the computer bleep every time a key is pressed, but first of all, what is the event-handler?

The Beeb's operating system works by interrupting whatever is going on in the foreground (ie, the user program) every 50 milliseconds or so, and sees to any work that needs doing by itself before handing back the processor to the user. The event is the way that the OS allows the user to tack a little routine on to the interrupt handling, which is then executed when a certain event has occurred. *FX13 and *FX14 enable and disable entry into the user event-handling routine when one of the ten events in figure 1 is selected. (The Electron only has the first eight events.)

*FX13 followed by the event number disables that event, and *FX14 followed by the event number enables that event. Control is handed to the user event-handling routine via an indirection vector at location &220 and &221 (EVNTV), into which the entry address of the handling routine is inserted. In other words, when the event is detected, control jumps to a machine-code program starting at the memory location given in locations &220 and &221. The event-handler is entered with interrupts disabled and should terminate with an RTS after no longer than

0 Output buffer empty
1 Input buffer full
2 Character entering input buffer
3 Analogue to digital conversion complete
4 Start of vertical sync
5 Interval timer crossing zero
6 Escape key pressed
7 RS423 error detected
8 Network error
9 User event

Figure 1. 10 events to enable and disable entry into the user event-handling routine

about a millisecond. Overstaying one's welcome with long event-handling routines has weird effects.

Once the microcomputer detects an event, the contents of the accumulator must first be stored so that the particular event can be determined later. This is stored in location &FC (a location reserved for this purpose in the Beeb).

Listing 2 shows the technique. First the event-handler must be enabled (line 130), then the pitch and duration of the bleep are changed to produce a very short high-pitched blip. If the bleep lasts longer than the keypress then a continual bleep will sound. The position where the code is to be put is now given by the integer variable 'code%'. Lines 160 and 170 set the event vector to point to the start of the new routine, again at &C00. Location &220 stores the least significant byte of the start address of the code and location &221 stores the most significant byte. Obviously it would have been shorter to write these two lines as:

```
160 ?&220=0
170 ?&221=&C
```

but then the program would require more changes if it's necessary to move the code to another place in memory.

Line 210 is the start of a FOR . . . NEXT loop. The reason for this is that the code needs to be assembled twice before it will work, because on the first pass it does not know the memory location where the subroutine 'end' will start, and an error message will be given. Therefore on the first pass any errors must be ignored. OPT 1 (line 240) supresses any assembler errors and gives no listing. On the second pass, this becomes OPT 3 and then any assembler errors are reported and a listing is given. On each pass P% needs to be reset to the start position in memory that the code is to be stored. Line 250 stores the value in the accumulator, which will be the event number detected, in location &FC.

Next, the processor status, the accumulator and the X and Y registers are saved onto the stack. The stack is an area of memory that the microprocessor uses for a temporary store of information. Once the registers have been saved to the stack, then the event number is compared with the value 2 at line 330. If the event was not the one expected, then control passes to the subroutine 'end'. This check is needed in case other events are also enabled. If there is no danger of this then the check could be ignored.

A bleep is sounded as described for listing 1, and control passes to the subroutine 'end', which restores the registers and returns from the event. The last thing that happens in listing 2 is that the keyboard event is enabled. It can be disabled at any time by typing:

```
*FX13,2
```

and re-enabled again by using:

```
*FX14,2
```

A=&0	Read line from currently selected input into memory
A=&1	Read system clock
A=&2	Write system clock
A=&3	Read interval timer
A=&4	Write interval timer
A=&5	Read byte of I/O processor
A=&6	Write byte of I/O processor
A=&7	Perform a SOUND command
A=&8	Define an envelope
A=&9	Read pixel value
A=&A	Read character definition
A=&B	Read palette value for a given logical colour
A=&C	Write palette value for a given logical colour
A=&D	Read previous and current graphics cursor positions

Figure 2. OSWORD's 14 machine code routines

Thus it is simple to control the events from within a program. Pressing Break will also disable the events, and reset EVNTV. The machine-code routine resident in page &C00 is not affected. The Break key can be programmed to restore EVNTV and the event:

```
*KEY10 ?&220=0: ?&221=&C:
 *FX14,2|M
```

Listing 3 is a program that works in mode 1. When a character enters the keyboard buffer an event is generated. The routine then changes the text colour. Therefore each letter typed in is a different colour. Some interesting effects can be seen if the event number is changed from 2 to 4 at lines 90 and 350. Then multi-coloured listings can be obtained.

Listing 4 is perhaps of a little more use. This routine tests the keyboard event as before and also check the ASCII value of the key. This is stored in register Y. Now it is possible to change the colour of the letter being typed in, depending upon its ASCII value. In this case, it has been programmed to print any character with an ASCII value of less than 65 (this is capital A) in white, and all other characters in yellow. This can be quite useful when typing in a listing as numbers will now be printed in a different colour from letters, thereby avoiding confusion with 0 and O, etc.

Another useful operating system call is OSWORD. OSWORD is actually a series of 14 machine code routines (figure 2), some of which are concerned with programming the sound chip inside the Beeb. There is no separate sound chip in the Electron. A feature of the OSWORD call is that it allows a series of parameters to be passed to the routine by placing them in a parameter block. Of these, OSWORD with A=7 is used for sound and speech programming and OSWORD with A=8 is used to define an envelope. To use OSWORD with A=7 a parameter block of 8 bytes is required (figure 3).

These parameters are the normal SOUND parameters. The block can be placed anywhere in memory. X is used to point to the least significant byte (lsb) and Y to the most significant byte (msb) of the start point of this parameter block. In zero page, locations &70 to &8F have been left free for the user's own routines, and this area of memory can be used to store the parameter block. So to start the parameter block at &70 on, X would be set to &70 and Y to 0.

To write an assembly language program to play the note produced by the Basic sound command:

```
SOUND 1,-15,52,10
```

the parameter block would be set up as shown in figure 4.

The amplitude is negative so the two's complement of −15 has to be worked out to place it in the parameter block. An easy way to work this out is to get the computer to do it:

```
PRINT ~-15
```

will return the value FFFFFFF1. To fill the parameter block, the indirection operator '!' (pling) is used. This pokes four bytes into four successive memory locations. Therefore if the variable 'param' is given the value &70:

```
param!0=&FFF10001
```

will set location:

```
&70=&01
&71=&00
&72=&F1
&73=&FF
```

param !4=&A0034 will set location:

```
&74=&34
&75=&00
&76=&0A
&77=&00
```

Once again the machine code is stored at &C00.

Listing 5 shows how a single sound

Parameter	Byte
Channel number	least significant byte
Channel number	most significant byte
Amplitude	least significant byte
Amplitude	most significant byte
Pitch	least significant byte
Pitch	most significant byte
Duration	least significant byte
Duration	most significant byte

Figure 3. The parameter block of eight bytes to use OSWORD with A=7

can be programmed. It could be used equally well for the Acorn speech synthesiser if the channel number is changed as appropriate. To encode a large number of sound or speech statements you would have to use a list-reading routine to fill the parameter block with details of the successive notes or words. If all eight parameters have to be changed each time then the task becomes daunting and tedious. One beauty of BBC Basic is that it is easy to mix machine-code programs with Basic, so if much sound is to be used it is probably better to resort to Basic for that part. Having said that, often you need only change the duration or pitch.

Location	Value
&70	1
&71	0
&72	&F1
&73	&FF
&74	&34
&75	0
&76	&A
&77	0

Figure 4. Parameter block to write an assembly language program to play a note produced by a Basic sound command

Listing 6 plays four notes. The parameter block is set up for the first note in the manner described above. Then only the pitch parameter is changed for each note. This is done by loading a new value into the accumulator, then storing it in the appropriate place in the parameter block before jumping to the OSWORD call.

Similarly to speak the three words 'not now please' the parameter block needs to be changed. Note that the position in the parameter block where the new word is stored is also different.

Listing 7 shows how the speech synthesiser can be programmed. 'Not' has a word number of &E3, 'now' a word number of &E4 and 'please' a word number of &F1. When programming speech, the pitch and duration parameters are both 0. So all four locations to be poked by 'param!4' will be 0.

Going back to the event handler, one use for it is to program a talking typewriter routine so that the speech system will speak any letter or number pressed. Using the 'character entering the input buffer' event, it is possible to write a routine that responds to keys being pressed regardless of what else is going on, such as the input required by a program or editing a piece of text. The main problem here is to filter out any unwanted words or punctuation. The word numbers needed are:

&30 to &3A Numbers from 0 to 9
&41 to &5A Capital letters
&61 to &7A Lower case letters

Listing 8 shows how this can be achieved. The machine code routine is stored at &C00, so &200 will be set to 0 and &221 to &C. Once again, the sound parameter block is stored starting at &70. *Wordwise* and *View* users will be disappointed to find that this program does not work with these wordprocessors, because they use locations &F0 onwards also. It will work if the parameter block is moved into page &C. There is plenty of room to store both the machine code and the parameter block in that page. The parameter block can be stored at starting location &C70. Change the two lines:

```
120 param = &C70
590 LDY #&C
```

and the talking typewriter will work with *Wordwise* and *View*. It is not a lot of use once a reasonable typing speed can be achieved, as the letters take far longer to say than the keys take to press, so the sounds lag far behind the keypresses. It can be cancelled by using:

```
*FX13,2
```

The event handler could be further utilised to interrupt at a fixed time period. This could be done by resetting the interval timer to the required time delay at the beginning of the interrupt. Another OSWORD call will do this. Listing 9 will play a sequence of six notes every half-minute (that is, until you get thoroughly bored with the sound). Six sounds are the most that can be processed in this simple way as one sound will enter the sound synthesiser directly and the other five will be stored in the buffer. (If only one sound channel is in use, there is a way of storing more than 20 sounds for use at any one time – but that's another story.)

The pitch values for the six sounds are stored at location &80 onwards. The last sound is repeated twice, effectively doubling the duration of that note.

OSWORD is used twice, the first time to set the interval timer and the second to put the six sounds into the sound buffer. The interval timer requires a five-byte number. This is given at lines 240 and 250. To set this to 30 seconds, you have to find the four-byte hex value of

Turn to yellow pages 97-100 for hints and tips listings 1 to 9

−3000. The negative number may seem strange, but this routine will add a count to this number, and we wish to detect it as it reaches zero. The timer works in centiseconds. To find this number simply print the following:

```
PRINT~ -3000
```

The response will be &FFFFF448. This is an easy way of finding different values to enter into the parameter block. The program could be extended so that the time is entered in seconds and the computer could do the rest of the work, but it does not look half as impressive as the unreadable parameter blocks. Unless a long delay is envisaged, there will be no need to alter the most significant byte at line 240.

The parameter block (lines 170 and 180) store the SOUND parameters. The pitch parameter block stores the pitch of the six sounds. These are:

&28	40	A, octave 2
&58	88	A, octave 3
&68	104	C#, octave 4
&60	96	B, octave 3
&44	68	E, octave 3
&44	68	E, octave 3

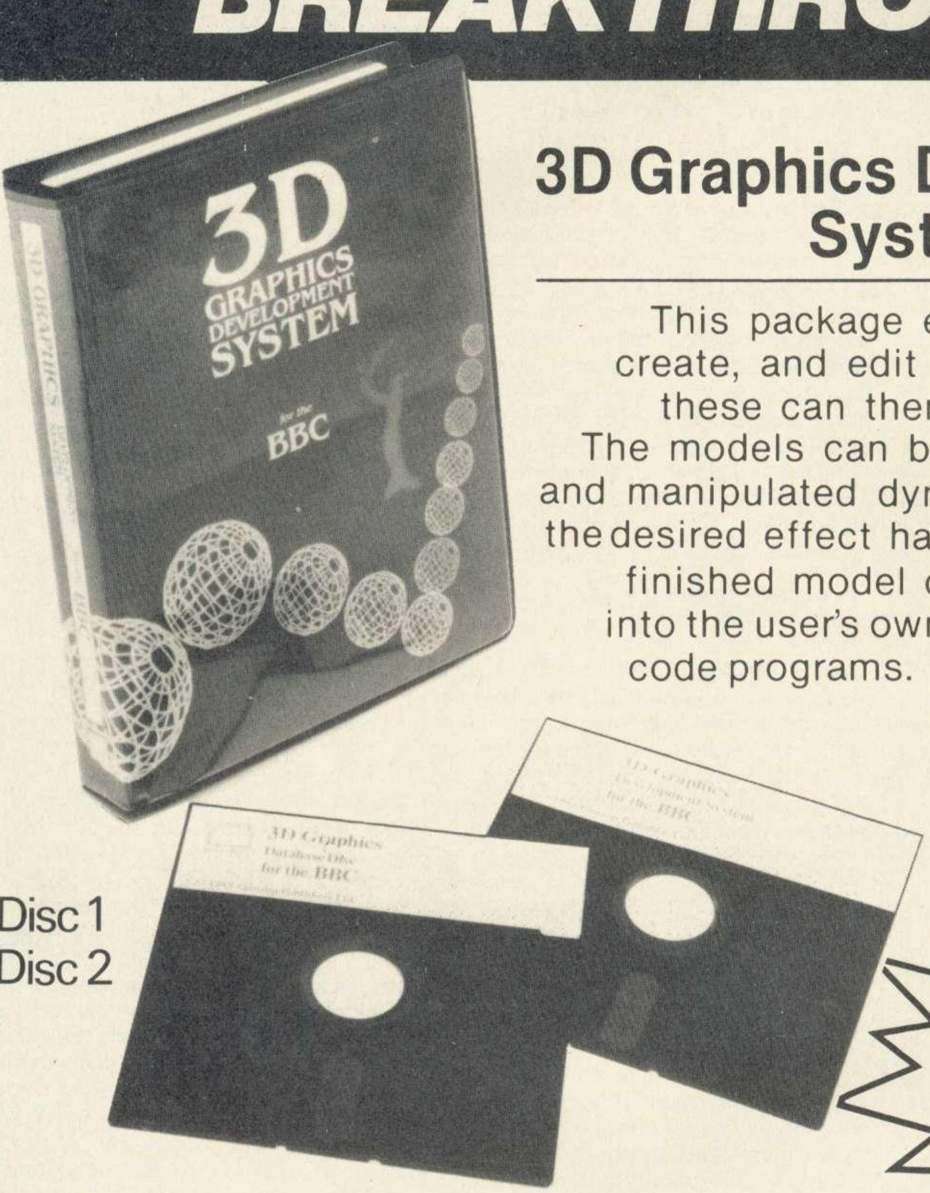
Before *Acorn User* gets inundated with letters saying I have got the pitch value one out, it's not me but the *BBC User Guide* that is incorrect. The Electron and the new BBC B+ handbooks are correct. Middle C should have a value of 52, and in all but the top octave the values should be one less than printed.

The interval-timed interrupt could be used to give a complete speaking clock, for instance, or to give an audible warning after a predetermined period of time, or as a countdown timer. The *Advanced User Guide* has a simple program to print the seconds at the top of the screen, which could be extended to a digital time readout. It could also be used to generate the rhythm for a piece of music, or even as a metronome. Going away from the sound commands, it could provide ideas for changing screen colours, text colours, etc.

Before ending, a note of caution should be sounded. It is possible to enable more than one event at once. Some of the programs illustrate how the particular event can be filtered out. What is important is to ensure that EVNTV is changed just before any event is enabled, otherwise the program could be lost. It is possibly better not to redirect EVNTV in the procedure, but to put it just before the event is enabled, if multiple events are to be used. It also could be useful to store the original value in EVNTV and replace it at the end of the routine so that more than one event could be redirected.

IF YOU have a technical hitch or a programming problem let Martin Phillips give his diagnosis. We'll pay £5 if you raise a really interesting point. Please give full details of the system you're using and include a listing where appropriate, making your question as specific as possible. WRITE TO: Hints & Tips, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

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GETTING YOUR SUMS RIGHT

Make no mistake, Tessie Revivis' introduction to the world of checksums will help lift your listings blues

EVEN if you don't understand how some of the programs that appear within the pages of *Acorn User* work, that need not stop you using them. Machine code often baffles people, but you don't have to understand terms such as 'opcode', 'accumulator' and 'mnemonic' to type it in.

If you look at machine code listings published in our yellow pages over the last 12 months you'll notice they have taken on a particular pattern. The lines are all short, perhaps averaging just half a dozen characters and each program is normally accompanied by notes on how to enter it. Keeping the lines nice 'n' short makes errors easy to find. If you made a mistake when you entered the program, the micro will stop when it reaches the error and print a message such as:

Error at line 670

Because line 670 and all other lines are short, the error should be very easy to locate and alter. The 'how to enter the program' notes should always be read before you start – they provide you with all the information you require to type the program in, often with hints and tips on easy ways of entering it, and there'll be a short listing that produces a checksum for the main program when you run it.

A checksum is simply the result of adding up all the bits of the program. When run, an assembly listing generates machine code, which is simply numbers that the micro can understand and act on. By adding up these machine code numbers a unique checksum for that program can be produced. If your checksum differs from that in the magazine then it is quite likely that you have made a mistake somewhere and you will need to check the program further. The June and July editions of First Byte gave you some hints and tips on how to do this.

Basic programs are thought to be easier to enter but this is not really true as they are often longer and less easy to follow than simple assembly language listings, particularly if the program contains multi-statement lines, in which several commands follow one after the other. The graphics program provided by Martin Phillips, starting this month, is a case in point. Because the program has so many good features they have had to be crammed into every bit of space available. This meant using multi-statement lines. Debugging this type of program listing is possible but, because of its compactness, very tedious.

So, this month I'm presenting a program that enables you to produce a checksum of each line of a Basic program. From now on whenever long and difficult Basic listings are presented in *Acorn User* we'll print a line-by-line checksum. Use the program presented here to produce your own checksum and compare it with ours. In this way you'll be able to find out in which line any mistakes are lurking and edit them accordingly. Once your checksum agrees with that published your program is correct and ready to run!

How to enter the program

Listing 1 contains the *Summer* program, and as you can see it's a mixture of Basic and assembler. In fact, the Basic listing is just there to do a few checks for the assembler – what we'll be using to calculate the checksum is the machine code generated by the assembly language program. You don't need to know how to program in assembler to user the program!

The program works on the Electron and BBC micro, including the new B+ and the Beeb fitted with a 6502 second processor attached and switched on. What you should do first is get a blank tape or disc, depending on which you are using. If it's a cassette ensure that it is fully rewound. Keep a pen and paper to hand. Now you can enter the program. All the lines increment in steps of 10 so you can use the command AUTO to do the line numbering for you. If you notice that you've made typing errors as you go along leave them. Simply make a note of the line numbers and correct them by retyping in the line when you have finished entering the listing. Once the program is complete, save it before you do anything else. Call the program file 'BCHECK', and save it using:

SAVE "BCHECK"

Now delete line 130 from the program by typing 130 and pressing Return. This line is responsible for saving the machine code, but we don't want it to do this yet.

Now run the program. When the program runs it expects to find the micro in either mode 7 or mode 6 (the default modes for the Beeb and Electron). If the mode is different it will set it to mode 6, whereupon you will see a lot of numbers appearing on the screen – this is the assembly language listing generating the machine code.

If mode 7 is in use the first line of numbers will start from 7A00; it will be 5800 in mode 6.

If you have made any typing errors the micro will respond with an error such as:

Syntax error at line 770

Simply list this line, ie:

LIST 770

and look for the mistake, correcting it once you have found it. All being well, the prompt will reappear. If, however, you get the error message:

checksum error – correct listing

you will need to do a bit of debugging. First check line 2280 to ensure that you have entered the correct checksum numbers. If these are OK then check the assembly listing between lines 340 and 2140. It is quite easy to make a mistake in assembler – for example, you might type in LDA 0 when you should have typed in LDA #0. The hash sign makes all the difference.

10	1629	400	600	780	97	1160	403	1540	1230	1920	770
20	1593	410	395	790	476	1170	675	1550	97	1930	97
30	1688	420	783	800	911	1180	224	1560	910	1940	376
40	2378	430	334	810	675	1190	247	1570	778	1950	232
50	63	440	689	820	752	1200	884	1580	600	1960	667
60	1209	450	848	830	769	1210	402	1590	387	1970	362
70	1119	460	942	840	550	1220	726	1600	582	1980	507
80	2084	470	943	850	884	1230	550	1610	579	1990	232
90	1590	480	337	860	921	1240	801	1620	918	2000	681
100	1591	490	944	870	388	1250	524	1630	97	2010	1023
110	1099	500	431	880	801	1260	233	1640	398	2020	712
120	762	510	945	890	226	1270	228	1650	256	2030	476
140	229	520	335	900	1246	1280	97	1660	97	2040	1023
150	63	530	847	910	97	1290	473	1670	1173	2050	412
160	1464	540	390	920	479	1300	402	1680	230	2060	600
170	859	550	941	930	387	1310	1148	1690	98	2070	232
180	850	560	432	940	600	1320	97	1700	1919	2080	687
190	948	570	942	950	366	1330	494	1710	757	2090	243
200	939	580	451	960	244	1340	217	1720	818	2100	1018
210	631	590	943	970	365	1350	976	1730	230	2110	1099
220	856	600	423	980	600	1360	1008	1740	97	2120	98
230	786	610	944	990	232	1370	688	1750	1041	2130	242
240	792	620	97	1000	567	1380	984	1760	239	2140	230
250	757	630	358	1010	97	1390	499	1770	361	2150	63
260	230	640	884	1020	675	1400	675	1780	456	2160	937
270	63	650	402	1030	753	1410	754	1790	334	2170	2586
280	849	660	903	1040	769	1420	769	1800	1046	2180	2591
290	326	670	1393	1050	551	1430	552	1810	226	2190	230
300	1119	680	97	1060	334	1440	999	1820	568	2200	63
310	2121	690	698	1070	1008	1450	813	1830	898	2210	1017
320	529	700	325	1080	998	1460	684	1840	965	2220	926
330	63	710	675	1090	358	1470	97	1850	245	2230	1980
340	1354	720	751	1100	884	1480	943	1860	888	2240	232
350	1377	730	769	1110	714	1490	985	1870	966	2250	887
360	333	740	549	1120	97	1500	921	1880	565	2260	1196
370	818	750	884	1130	797	1510	975	1890	911	2270	242
380	614	760	481	1140	358	1520	911	1900	945	2280	1795
390	386	770	603	1150	884	1530	217	1910	1032	2290	3410
										2300	229

Figure 1. The checksum figures for the 'Summer' program

If you find any mistakes correct them and re-run the program. Once the program has run without throwing up any errors it should be bug-free.

The next thing to do is to test the machine code itself. To do this type in the following command carefully:

```
CALL HIMEM
```

Press the Return key at the end, and all being well the screen will clear and present you with a line something like:

```
10        1629
```

This shows us that line 10 has a checksum of 1629. Don't worry at this stage if your checksum value is different or if it is followed by an asterisk – we'll look into this in a moment. Press the space bar and the next line will appear. In fact, every time you press the space bar a new line will appear with its checksum. The first half-dozen lines might look a bit like this (again don't worry if they are not exact):

```
10        1629
20        1593
30        1688
40        2378
50        63
60        1209
```

You can abort the listing at any time by pressing the Escape key – try it. The program quickly completes its task, listing all the checksum lines and then returning you to the prompt.

If your program doesn't function as described press Escape to leave it. If this doesn't work press the Break key and type OLD to restore your original listing, and carefully re-check it.

Checking your listing

What if your checksum values don't correspond exactly to mine? First check the relevant line of your program with the listing. Is it exactly the same? For example, have you entered a couple of extra spaces, or is a space missing? This is the most likely reason. Some of your program lines might have an asterisk, like this:

```
10        1662*
```

Not only is the checksum value different but there's also an asterisk on the end. This symbol tells you that you've typed in an extra space at the end of the listing (this is of course invisible in your own listing). To eradicate it use the Copy key to re-enter the line and press Return at its very end.

Remember, to leave the program you press Escape and to enter it you type:

```
CALL HIMEM
```

If you press Break for any reason you will need to re-run the program before performing CALL HIMEM.

Once you're confident that you've entered the program correctly, re-enter line 130:

```
130PROCsave
```

Now re-save the program (rewind the cassette tape if you need to).

Figure 1 provides the checksum figures for the entire program. Type CALL HIMEM and check that yours agree. Make a note of any lines that don't and then list and correct them. Almost certainly by this stage any difference in values will be caused by extra spaces being inserted. Note that the listing of *Summer* has been produced using the LISTO1 option. Don't insert any extra spaces between line number and start of the program!

Once the program is complete re-save it on disc or the front of your tape under the filename 'BCHECK'. Tape users should now turn the tape over and rewind it to the start of the second side.

Now run the program. Once it has run it will save the machine code. Tape users should answer the prompts in the normal way.

Using the machine code

Having finished with our normal Basic listing, we are now interested only in the machine code listing just saved. Nevertheless, it is wise to keep the main program saved on this tape, which should be clearly labelled and used for nothing else!

Using the machine code is simple. First you type in your program as usual, following any 'notes on entering the program'. Then save it to tape or disc, just for safety. The next step is to run the checksum program, *BSum*. To do this we must first re-set the value of HIMEM, as follows:

```
10 REM Basic Checksum
20 REM Tessie Revivis
30 REM for BBC,B+,Elk
40 REM (c) Acorn User August 1985
50 :
60 PROCvariables
70 mode%=FNmode
80 IF mode%<6 THEN mode%=6 : MODE 6
90 IF mode%=7 THEN HIMEM=&7A00
100 IF mode%=6 THEN HIMEM=&5E00
110 PROCassemble
120 PROCcheck
130 PROCsave
140 END
150 :
160 DEF PROCvariables
170 loline=&70
180 hiline=&71
190 checklo=&72
200 checkhi=&73
210 page=&74
220 buffer=&76
230 table1=&80
240 table2=&85
250 space=&8A
260 ENDPROC
270 :
280 DEF FNmode
290 A%=135
300 byte%=USR(&FFF4)
310 mode%=(byte% AND &FFFFFF)/&FFFF
320 =mode%
330 :
340 DEF PROCassemble
350 FOR pass=0 TO 3 STEP 3
360 P%=HIMEM
370 [OPT pass
380 .start
390 LDA #12
400 JSR &FFEE
410 LDA &18
420 STA page+1
430 LDA #0
440 STA page
450 STA table2
460 STA table2+1
470 STA table2+2
480 LDA #3
490 STA table2+3
500 LDA #&27
510 STA table2+4
520 LDA #1
530 STA table1
540 LDA #&A
550 STA table1+1
560 LDA #&64
570 STA table1+2
580 LDA #&E8
590 STA table1+3
600 LDA #&10
610 STA table1+4
620 \
630 LDY #0
640 LDA (page),Y
650 CMP #13
660 BEQ repeat
670 JMP starterror
680 \
690 .repeat
700 LDY#0
710 INC page
720 BNE over1
730 INC page+1
740 .over1
750 LDA (page),Y
760 CMP #&FF
770 BEQ out
780 \
790 .main
800 STA hiline
810 INC page
820 BNE over2
830 INC page+1
840 .over2
850 LDA (page),Y
860 STA loline
870 LDA #32
880 STA space
890 SEC
900 BCS printline
910 \
920 .line
930 LDA #13
940 JSR &FFEE
950 LDX #9
960 TXA
970 .tab
980 JSR &FFEE
990 DEX
1000 BNE tab
1010 \
1020 INC page
1030 BNE over3
1040 INC page+1
1050 .over3
1060 LDA #0
1070 STA checklo
1080 STA checkhi
1090 LDY #0
1100 LDA (page),Y
1110 JMP skip
1120 \
1130 .addloop
1140 LDY #0
1150 LDA (page),Y
1160 CMP #32
1170 BNE leap
1180 PHA
1190 INY
1200 LDA (page),Y
1210 CMP #13
1220 BNE leap2
1230 LDA #ASC"*"
1240 STA space
1250 .leap2
1260 DEY
1270 PLA
1280 \
1290 .leap
1300 CMP #13
1310 BEQ exitloop
1320 \
1330 .skip
1340 CLC
1350 ADC checklo
1360 STA checklo
1370 BCC over
1380 INC checkhi
1390 .over
1400 INC page
1410 BNE over4
1420 INC page+1
1430 .over4
1440 BNE addloop
1450 .lineint
1460 BCS line
1470 \
1480 .exitloop
1490 LDA checklo
1500 STA loline
1510 LDA checkhi
1520 STA hiline
1530 CLC
1540 BCC printline
1550 \
1560 .checksum
1570 LDA space
1580 JSR &FFEE
1590 LDA #13
1600 JSR &FFE3
1610 JSR &FFE0
1620 JMP repeat
1630 \
1640 .out
1650 RTS
1660 \
1670 .starterror
1680 BRK
1690 ]
1700 $P%=" Bad Program Error"
1710 P%=P%+LEN($P%)
1720 [OPT pass
1730 BRK
1740 \
1750 .printline
1760 PHP
1770 LDX #4
1780 .back
1790 LDA #0
1800 STA buffer,X
1810 SEC
1820 .again
1830 LDA loline
1840 SBC table1,X
1850 TAY
1860 LDA hiline
1870 SBC table2,X
1880 BCC one
1890 STA hiline
1900 STY loline
1910 INC buffer,X
1920 BNE again
1930 \
1940 .one
1950 DEX
1960 BPL back
1970 LDX #5
1980 .back2
1990 DEX
2000 BEQ once
2010 LDA buffer,X
2020 BEQ back2
2030 .once
2040 LDA buffer,X
2050 ORA #&30
2060 JSR &FFEE
2070 DEX
2080 BPL once
2090 PLP
2100 BCS lineint
2110 BCC checksum
2120 ]
2130 NEXT
2140 ENDPROC
2150 :
2160 DEF PROCsave
2170 IF mode%=7 THEN *SAVE "BSUM" 7A00 7B10 7A00
2180 IF mode%=6 THEN *SAVE "BSUM" 5E00 5F10 5E00
2190 ENDPROC
2200 :
2210 DEF PROCcheck
2220 start%=&7A00
2230 IF mode%=6 THEN start%=&5E00
2240 N%=0
2250 FOR A%=0 TO 270
2260 N%=N%+(start%?A%)
2270 NEXT
2280 IF N%=34832 OR N%=34748 THEN ENDPROC
2290 PRINT"Checksum error - correct listing"
2300 END
```

Listing 1. 'Summer' program in Basic and machine code for calculating a program's checksum

For BBC

MODE 7
HIMEM = &7A00

For Electron

MODE 6
HIMEM = 5D00

Now load and run the machine code thus:

Disc users type

*BSUM

Tape users type

*RUN BSUM

Now the machine code will load and run, presenting you with your very first checksum. You can always Escape from the program and re-enter with CALL HIMEM.

How it works

If you are quite happy using the program you might be interested in understanding how it works – just the principles.

For example the program line:

10REM

is stored in memory as follows:

2 bytes – program line number
1 byte – line length
1 byte – token for REM
1 byte – <RETURN>

What the *BSum* program does is to add the contents of the line starting from the line-length byte. It doesn't include the line numbers themselves, so even if your line numbers differ your checksum should not.

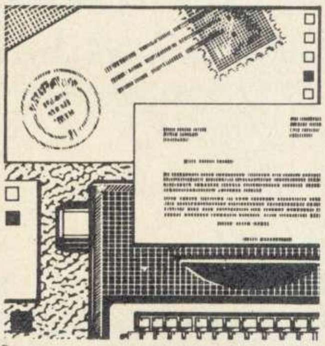
The line-length byte contains the number of bytes in the program line, which in this case is 5. The REM is encoded by Basic into what is known as a token – simply a number that Basic recognises to be the REM statement. In this case the token for REM is 244.

The *BSum* program does not count any Returns so that the checksum for this line would be:

244 + 5 = 249

You can use *BSum* to check your entry of Martin Phillips' *Easyplot* listing (see page 80).

Write to: Letters, Acorn User, Redwood Publishing, 68 Long Acre, London WC2H 7ED



A bit of a difference

Sir, Peter Gaunt's routine for changing lower case into upper case letters (*Acorn User*, May) is a thorough and elegant piece of code and seems capable of solving a very common problem in writing educational programs but I baulked at having to add 70-odd lines of assembly code to every program.

In this article he says that though there are a number of ways of making this change in Basic, though 'none of them is completely satisfactory'. The method I have always used, which seems to work well, depends on the fact that the bit pattern of the ASCII code of lower case letters differs from that of upper case letters by only one bit: the third of which is always 0 for upper case and 1 for lower case letters. I use statements such as:

```
100 I%=GET
110 I%=I% AND &DF
```

It's a bit clumsy to use this method for a string from an INPUT statement, because it may contain characters other than letters, but with care it can be made to work.

This type of method may be slower but one must weigh this against having a lot of extra code in the program which becomes a problem when writing interactive graphic routines.

Colin Dixon
Imperial College of Science and Technology
London

Simple Basic case conversion as you suggest was covered extensively in First Byte in the March issue. The great advantage of Peter's routines are that they are completely invisible to the user as the machine code sits out of the way. They are particularly suitable for schools, where children are entering programs and do not understand how to perform the conversion from Basic or indeed the need to do so.

Phloopy flop

Sir, In November 1984 my parents purchased a Phloopy Drive from Phi Mag Systems which despite conversion to the BBC micro as per the manual failed to work. The computer was sent to Phi Mag, where it was converted by their engineer – not according to their manual, incidentally. When the computer returned, the Phloopy would still not operate and a 'Read Only' instruction was displayed.

The Phloopy was apparently reading that write protection was present on the Phloopy cartridge. This was not so. The drive was returned to Phi Mag, but when returned the fault was still present. Meanwhile Phi Mag has ceased to trade and I'm stuck with a Phloopy that doesn't work.

First, can you advise me on whether there is a chance of compensation as the Phloopy was ordered through the excellent pages of your magazine. Secondly, do you have knowledge of any company continuing the Phloopy drive?

Wayne Webb
Sussex

First, *Acorn User* does not operate an advertising protection scheme and cannot be held responsible for advertisers who cease trading after placing their ads. Secondly, we regret we haven't heard of any company still handling the Phloopy: can readers offer any help?

Quadline problem page

Sir, Having spent considerable time typing in the *Quadline* listings on my Electron, I was none too pleased when the program failed to run (*Quadline* would not Chain Q2). Careful experimentation with listing 1 showed that the problem was with lines 150 and 200. Both of these lines contained references to PAGE &D, which led me to the cause of the problem.

My Electron is permanently connected to the Plus 1 and the manual for the Plus 1 says that when 'Load, Save, Chain' etc are used the unit is automatically disabled for the duration of that command; however, the Plus 1 also uses PAGE &D in its normal use which is where the problem lies.

Typing *FX163,128,1 to disable the unit explicitly failed to solve the problem, and as a last resort I disconnected the Plus 1 from the micro then loaded the program and it ran perfectly with no problems.

The inconvenience of this procedure every time I wanted to run *Quadline* required a permanent solution. I changed all the references to PAGE &D (lines 150, 160, 170, 180, 3360, 3490, 3500 and 3560 in listing 1 and line 60 in listing 2) to PAGE &A. Connecting the Plus 1 to my Electron, I loaded *Quadline* and had no problems in running it.

The reference in the Q2 listing at line 1170 to mode 7 should of course be mode 6 if you are an Electron user.

Roy Goulding
Kent

Warming to CP/M

Sir, Thank you for providing a spot dedicated to the Z80 addons for the BBC micro. I had been debating on which second processor to purchase for some time, and in fact had purchased a 6502. I very quickly became disillusioned with it as it did not add any software to my library. I don't mean I was looking for freebies, but all the software which would run on the 6502 second processor would run just the same in the basic system. If software houses had produced some upmarket programs specifically making use of the 6502, I might have stayed with it. However, your obvious support for the Z80 convinced me to go back to the dealer before it was too late and move up to the Acorn Z80.

Before the move I had been told horrendous stories about the unfriendly nature of CP/M, but I have to say the transition has been quite painless, though not helped particularly by the documentation which is supplied with the package. The CP/M manual is about the most incomprehensible computer book I have ever set eyes on but I would recommend *The CP/M Primer* by Murtha and Waite, and the *CP/M Bible* by Waite and Angermeyer to anyone making their first forays into the CP/M world.

As regards technical tips, I'm no programmer, but I did find two programs on the Z80/BBC Basic disc supplied with the Acorn setup. The first, READDFS.BBC, allows the CP/M to read a DFS disc and to transfer programs and data files to the new environment. From there the second program, 6502-Z80, will convert the program to run under CP/M. It should, of course, be noted that programs containing machine code will not run unless the 6502 code is replaced manually with Z80 instructions (totally beyond me!). Using these two routines, I have successfully transferred over 20 Basic programs to run on the Z80.

My second tip relates to the AMX Mouse. Probably, like me, most people will assume this only works with the 6502. I was astonished to find that provided the mouse commands are given from BBC Basic (Z80 version), the mouse will work perfectly on this second processor. When one returns to CP/M the mouse will remain active unless the Control-Break keys are pressed, and I have used it with *MemoPlan*, *FilePlan* and *GraphPlan*.

Thanks again, keep up the good work.

Brian Dandridge
West Sussex

Logo: what was lacking

Sir, As a recent purchaser of Logotron Logo and a regular reader of *Acorn User*, I was looking forward to Mr Telford's review of four Logo products. I was sadly disappointed.

First about the pedestrian benchmarks which did not test the power of the products. Logo is a simple language lacking structures such as REPEAT . . . UNTIL or FOR . . . NEXT or WHILE . . . WEND. These structures are usually produced using recursive functions, but only one benchmark used recursion.

Second, there was no real discussion of graphics. Logotron Logo for example supports a square 'window' which can be altered by the user, but there was no mention of this. Similarly, much graphics work in Logo is done using recursive patterns. This aspect of the language was not tested.

Next, why no mention of important language features, eg local variables? Logotron

Logo does not have a local primitive although it does support local variables created as inputs to a procedure. This feature becomes important when using recursion.

There was little discussion of recursion. On page 69, Mr Telford talks about a recursive function 'running out of room'. Since recursive functions run out of stack space rather than room, this is at best simplistic.

Finally, he put across a childish attitude to standardisation. I take the American magazine *Byte* which publishes Logo programs for computers as diverse as the IBM PC and the Apple. I have found no major difficulties in converting graphics programs for these computers to run on the BBC. May I suggest, therefore, that if Mr Telford wants to see how to review Logo he gets hold of the August 1984 issue of *Byte* and uses the IBM PC benchmarks on his four Logos.

J McCabe
Grantham

Joe Telford replies:
The benchmarks I used reflect the power of the Logo language primitives, not the elegance of programming. For example, a more direct comparison between Logo graphics can be made by isolating LEFT RIGHT FORWARD and BACK (benchmarks 7 & 8) than by drawing pictures.

It is easy to fall into the trap of assuming that Logo is a simple language but it is rich in structures, for both data and programs. Parts of the language appear easy to use, but practical experience with teachers learning, say, list-processing techniques, has shown that some aspects are anything but simple to grasp.

By 'pedestrian' I must assume Mr McCabe refers to the general speed of execution of the benchtested Logos. The benchtests I use reflect the need for simple, decisive, easy to measure tests of the speed of implementations. Their philosophy is updated from the original 'Kilobaud' benchtests of Basic, to reflect the education-related uses of the various Logos.

Benchmark 10 was aimed specifically at using recursion and as such gives a measure of speed in this area: recursion itself. An additional benchtest was included which instead of measuring speed, checks how many recursions can be performed before stack space is filled. Checking against reviews of Logo in other magazines, my relative comparisons seem to agree quite well.

Because graphics are the easy way into Logo, it is assumed that they are all that count. Graphics are only part of the implementation (see April issue) and as such need *only* equal consideration.

Language features were commented on only as far as space allowed. Perhaps the Editor can find space in a forthcoming edition to publish the comparative features charts I produced to cover this point.

Most of the Logo Interpreters I have used give an 'out of room' message, so I use this expression to relate more closely to the needs of users who are less technically minded than Mr McCabe.

Logo recursion is such an important feature that to do it justice requires an article in itself. This is planned for the near future.

A technically minded person can perform a graphics conversion easily, and a list-processing conversion with little more difficulty. My point about standardisation, however, is that all major features of implementations should be compatible so that in the 'language of learning' time isn't lost unlearning and relearning the same information as a child or teacher changes school. Consider the training implications for a conservative additional 5000 teachers plus 15,000 children per term using any one of the six BBC implementations of Logo.

Finally I thank Mr McCabe for his advice about *Byte*, an excellent magazine, and the August 1984 issue, which is often quoted as the bible on Logo. I felt that repeating this exercise for *Acorn User* was not wise, as there is a different emphasis on Logo in education in the UK. My own feelings on Logo are that we should use and approach it with a healthy cynicism, and rely less heavily on the judgments of others than our own experiences – in other words, apply the true Logo philosophy of do and learn.

Graph mod

Sir, Here's a slightly modified version of Nigel Jenning's excellent *Graph* program (April issue). The modification is for users of Watford's Dumpout 3 ROM which is 6502 second processor compatible.

All attempts to use line 290 of the program failed, despite checking the values of Code%(8) at that point and I can only hope that your readers may find an explanation. In the original listing, line 290 was deleted and a new line inserted after line 640:

```
641 IF Code%(8) PROC_DUMP:
    PROC_DISPLAYCODE:
    ENDPROC
```

The dump itself consists of the code:

```
1731 *GWINDOW
1732 *GIMAGE EPSON
       V&FO H&12A RO
1733 ENDPROC
```

The *GIMAGE command will give a 1:1 plot on a Taxan/Kaga KP910 across the page whereas *GIMAGE Epson V&CD H&100 R1 (or R3) will give a 1:1 plot lengthways ie, along the Line Feed axis. The dump has been used on the BBC micro alone, and with the second processor using both Basic and HiBasic.

M R Ashcroft
Middlesex

Towards the Topless Turtle

Sir, Unlike Dr Macleod (May letters) I have long since ceased to be amazed. The point I made in my letter (February) was a very simple one – it is not possible to make a mechanical contrivance which consists of electric motors, wheels, gears and digital sensors, move in centimetres when its unit movement is 1.7mm. Nor is it possible to make such a contrivance move in both inches and centimetres as the makers of the Valiant claimed. To suggest that the LOGO command REDEFINE makes this possible is to descend into degenerate formalism, as I predicted in my original letter.

My 'reality' is that of Robert Watt and I use it to keep my pedagogical feet on the ground. First of all I ensure that my machines conform to the unit of measurement adopted by the culture in which they are embedded; and then, and only then, do I REDEFINE to provide children with idiosyncratic units – perhaps the length of the Turtle itself, or their right toenail!

If the doctor would like to raise the level of debate to an amazingly amazing one, he might like to join me at BLUG85 (the British Logo User Group Conference to be held at St Andrews College of Education, Glasgow in August), when I shall be leading a seminar called 'Topless? Turtle'.

M P Doyle
Ravenscliffe Centre
Bradford

Where do we go from here?

Sir, The Computer Education Domain of the Microelectronics Education Programme is intending to produce a publication designed to help headteachers and other curriculum planners make informed decisions on the role of examinable Computer Studies. It is also intended to help teachers, and potential teachers, of Computer Studies improve the standard of teaching especially in view of the changes being caused by the introduction of the common 16+ examination.

One section of this publication is intended to be a glimpse into how people see the position of Computer Studies/Science in 10 years' time and is provisionally entitled 'Where do we go from here?'. I would be grateful to hear from anyone who has a particular vision of this small section of the future.

Neil Stanley
Project Coordinator
Computer Education Centre
Liverpool Polytechnic
70 Mount Pleasant
Liverpool L3 5UX

2 bugs in View 2

Sir, The new *View A2.1* costs about £55. Incredibly, two of the worst bugs from its shabby predecessor, the A1.4, are included in this high price.

First, LOAD :0.T.SRCFILE does not, giving <Syntax error> instead! Second, suppose you are editing default drive :0 file T.SRCFILE and then try to save to another drive with SAVE :2.T.DESTFIL the system does not do as requested but overwrites :0.T.SRCFILE, thus causing much anguish, and the feeling that *Wordwise* might have been a better buy.

How come none of the magazine reviews notice these blunders?

James Miller
Cambridge

CENTRAL PROCESSING...

CENTRAL PROCESSING...

A Salter, Stafford
BUILD files are stored as ASCII text files on disc, so it is possible to manipulate them. The easiest way is to use a wordprocessor such as *View* or *Wordwise*. All you do is to load the file in as though it was text. I always use a wordprocessor to create this type of files for use as !BOOT files anyway. If you do not have a wordprocessor, it is possible to show them on the screen using *TYPE. These can then be added to a new *BUILD file by using the COPY key.

David Newbery, Hornchurch, Essex
Snapper and *Starship Command* are available in cartridge form for the Electron-Plus 1 and can be used with joysticks. In addition the tape based *Monster, Go, Crazy Tracer, Free Fall, Maze, Boxer, Firebug, Snooker* and *Chess* all use joysticks.

Mathew Burgess, Bromsgrove, Worcestershire
There is no keyboard conversion program that will allow you to use a joystick to control keyboard-only games. There are many ways in which a program can handle the keyboard, and it is not a simple task to write even a general routine – let alone patch it into the game you are using.

Capt Z A Kidval, Karachi
Machine code programs can obviously be placed into ROM, as this is how most firmware is constructed. Basic programs can be put into ROM too, after being formatted to the ROM filing system configuration, as outlined in the User Guide. Once this has been done, and the EPROM blown, the ROM filing system can be selected by *ROM and programs LOADed as normal.

Malcolm Veitch, Birmingham
Probably the best way to keep track of your disc files would be to implement a database, customised to contain exactly the information you want. Two commercial databases that would prove suitable are Masterfile by Beebugsoft and the about-to-be-released Viewstore from Acornsoft. Of course you could save the expense and use the database presented in the December 1984 issue of *Acorn User*.

L Langston, Watford, Herts
There were no errors in the Introducing Toddlers to Micros programs in the August 1984 issue of *AU*. The Arguments error you are getting would suggest that the number of values being passed into the procedure do not balance up. I suggest you look at the line containing and receiving the PROC calls in question.

Shelly Raynor, Bolton
There are a few companies manufacturing external keyboards for the BBC micro. Viglen produce one, so do Solidisk and Oak Computers who provide them with a main BBC micro board case containing disc drives. Check the advertisements in *Acorn User* and then phone the manufacturer to check prices.

Gerald French, Templecombe, Somerset
The reason you are having problems saving and loading your own programs on tape, is that the volume setting on your cassette recorder is incorrect. Thus you get garbled messages, like ??**??e???77 when you try to load it back in.

Ideally volume and tone settings should be set at around 75 per cent when you are recording. Do not adjust these when you come to load back in. If the garbled message still persists then adjust the volume and tone controls in very small steps until you get the proper messages. Once you have these levels correctly set, you can place some sticky tape over them to stop the controls wandering.

Robert Aurelle, St Martin D'Heres, France
The address of Atarisoft is: Software Products Division, Atari Corp., Slough, Berkshire. You should be able to get *Pole Position* direct from them.

Because of the large amount of technical enquiries we receive in the *Acorn User* office we are now unable to reply to individual letters. However, this new feature is intended to answer as many of your queries as possible, and provide a useful information spot. Please keep your letters short and to the point.

Kitty explains how you can enlarge the Beeb's program memory



Q I am looking to expand the memory capacity of my BBC micro. A friend has informed me that I should buy sideways RAM – do you agree? However I have seen advertisements for an Aries B20 RAM board, which is not sideways RAM. I am finding this all very confusing.

Craig Dradge
New Zealand

A You do sound confused! First, the Aries B20 board is not a sideways RAM board (for a definition of sideways RAM, look at the September 1984 edition of Dear Kitty). To explain just what the Aries B20 board does let me first detail how the Beeb handles its memory.

In a normal BBC micro there is 32k of memory. This figure is reduced as the Operating System requires some memory in which it can do its calculations. It reduces further still if you have a disc filing system fitted, perhaps leaving you about 27k for programs. Now the screen display also requires memory. When you switch on mode 7 is selected: this takes 1k of memory, leaving you with about 26k. The real problem occurs when you switch to a high-resolution screen mode such as mode 0, 1 or 2. These modes require 20k of memory to function, leaving a meagre 6k of memory for programs.

If you fit an Aries B20 board this supplies the 20k of RAM for use by the screen. This means that whatever screen mode you use, all of the remaining BBC memory (ie, around 27k in a normal BBC with DFS) is available for program use. So if you are looking to gain programming memory on the BBC, the Aries B20 is a recommended way to do it.

Q I am having a lot of trouble understanding how to use the *SPOOL and *EXEC commands on my Electron. Could you please help me out by explaining how they work?

Ellen Brush
London

A With both the Electron and the Beeb, you can think of *SPOOL and *EXEC as being similar to SAVE and LOAD. The way in which they differ is that they do not save and load the program in its true storage form; instead they save and load its ASCII form, in other words, the form in which it is entered at the keyboard.

To see them in action, try this example. First enter a short program – this can be anything, like four or five lines from any of the programs on the yellow pages. To spool this program to tape or disc proceed as follows,

```
*SPOOL PROG
LIST
*SPOOL
```

PROG is the name that you wish to give to your program. Tape users should now press RECORD. The next command is, surprisingly, LIST. As the program is listed it is written, line by line, to the file on disc or tape. Once the program has listed you can close the file simply by typing *SPOOL. To load a spooled file back into memory it must be *EXECed (or executed). The command to do this is simply

```
*EXEC PROG
```

where PROG is the program filename.

Now the program will be read in as though it had been typed in at the keyboard. The obvious advantage of this method is that it allows you to merge a program in memory with one on tape or disc, providing the line numbers are different, otherwise any existing lines of text will be overwritten. To see exactly how this works try a few examples.

Watford Electronics

Dept. AU, Jessa House, 250, Lower High Street, WATFORD, ENGLAND
Tel: Watford (0923) 37774/40588 Telex: 8956095 WATFRD
ACCESS ORDERS Tel: (0923) 50234

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BBC MICRO 32K + 32K

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BBC B with Acorn DFS	**£338**
BBC B with Watford DDFS	**£355**
BBC B with ECONET	**£335**
BBC B + DFS + ECONET	**£395**
BBC B + DFS + 32K RAM Card	**£397**
BBC B + 13 ROM Board fitted	**£322**
BBC B + 32K RAM + 13 ROM Board	**£379**
BBC B + DFS + 32K RAM + 13 ROM Board all fitted	**£429**

Complete BBC B ECONET Networking System now available.

(P.S. ROM based software purchased with any of the above Micros will be fitted free of charge).

6502 Acorn 2nd Processor	**£175**
Z80 Acorn 2nd Processor	**£339**

TORCH Z80 Card + Perfect Software	**£275**
TORCH Z80 Card+Soft. + Disc Pack	**£580**
TORCH GRADUATE Z80 System	**£925**

Acorn Bitstick	**£325**
Acorn IEEE Interface Complete	**£280**
Acorn Teletext + Interface	**£195**

(Securicor carriage on Micros £7)

Dust Cover for BBC Micro

Protects your expensive Micro from foreign bodies while not in use. **£3.50**

PRINTERS

- EPSON RX80 Printer **£209**
- EPSON RX80 F/T Printer **£219**
- EPSON RX100 **£342**
- EPSON FX80 Printer **£315**
- EPSON FX 100 Printer **£429**
- EPSON JX-80 Full Colour Dot Matrix Printer. Prints in 7 Colours. Upto 160 cps **£525**
- EPSON Paper Roll Holder **£17**
- FX80 tractor attachment **£37**
- Centronics Printer Cable to interface all the above Printers to BBC **£6**

(Securicor carriage charge on printers £7)

EPSON HI-80 PLOTTER

The latest addition to the popular range of EPSON Printers/Plotters. Prints in upto 10 colours. Has many more features. Please write in for spec sheet.

£399 (£7 carr.)

RX & FX PRINTER INTERFACES

Epson interfaces fit inside the printer to allow connection using techniques other than Centronics.

RS232 **£25** RS232 + 2K Buffer **£55**
IEEE 488 **£62**

SPECIAL OFFER

HITACHI EPROMs for Sideways ROMs

2764-250nS £2.99
27128-250nS £5.99

RAMs (Low power) for ATPL, WATFORD, etc., Sideways ROM Boards

6264LP (8K) £7.25

4 COLOUR PLOTTER PRINTER

SAKATA SCP-800 printer/plotter facilitates plotting & printing in 4 colours on paper upto A4 size, using easily replaced pens. In text mode it prints upto 12 CPS. Max 160 Char. per line. In graphics mode it offers full plotting facilities incl. drawing, moving, scaling of text, rotation & drawing of axes. (Write for a sample printout).

Only £175

Set of 4 SPARE PENS only **£3.95**

PRINTER SHARERS

Connects

3 BBC Micros to 1 Printer	**£65**
6 BBC Micros to 1 Printer	**£129**

BROTHER HR-15

Brother HR15 is a high-quality daisy-wheel ideal for a budget printer for serious use. Notable features of this printer include a 3k buffer, 18cps (max), bi-directional proportional spacing, Centronics or RS232 interfaces as standard, optional Sheet Feeder and Keyboard.

ONLY **£325** (carr. £7)

Single Sheet Feeder	**£185**
Electronic KEYBOARD	**£135**
TRACTOR FEED Attachment	**£84**

RIBBON CARTRIDGES: Fabric **£3.75**; Carbon **£3.75**; Multistrike **£6**

DAISYWHEELS (various typefaces) **£18**

With immediate effect, we are offering at no extra cost ON-SITE 12 months Maintenance on all HR15 Printers purchased from us.
W.E. GIVES YOU A GREAT DEAL

Listing Paper (Perforated)

1,000 Sheets 9½" Fanfold Paper	**£7**
2,000 Sheets 9½" Fanfold Paper	**£13**
1,000 Sheets 15" Fanfold Paper	**£9**
Teleprinter Roll (Econo paper)	**£4**

Carriage on 1,000 Sheets £1.50

PRINTER LABELS

(On continuous fanfold backing sheet)

1,000 90×36mm	**£5.00**
1,000 90×49mm	**£7.75**
1,000 102×36mm	**£6.25**

Carriage on 1,000 Labels £1.00

All prices exclude VAT

KAGA KP810 NLQ PRINTER

This Dot matrix printer has EPSON FX/RX compatible control codes and is functionally equivalent to an FX80 with the added advantage of its 'Near Letter Quality' mode. It is solidly built and features include: Normal, Italic, Enlarged, super/subscript, proportional spacing and user-defined character set. Extras over the FX80 included in the price are Near Letter Quality (NLQ) print ideal for correspondence, Proper adjustable tractor feed, half speed quiet mode and 3K buffer. The printer is bi-directional and logic seeking to give a speed of 140CPS for high throughput in conjunction with the standard 3K buffer. 8K RAM may be added to give more user-defined character sets. Centronics parallel interface + Watford's 12 month NO QUIBBLE WARRANTY.

Special Offer: ONLY **£239** (£7 carr.)

Kaga RS232 Interface	**£49**
Kaga RS232 Interface + 2K Buffer	**£69**
Kaga RS232 Interface + 16K Buffer	**£95**

KAGA KP910 Printer

Similar to the KP810 but with 17" carriage for wide print. Gives 156 columns of normal print or 256 columns in condensed mode. Ideal for printing out spreadsheets.

ONLY **£339** (£7 carr.)

PRINTER LEAD

Centronics lead to connect BBC micro to EPSON, KAGA, SEIKOSHA, NEC, STAR, JUKI, BROTHER, SHINWA etc. printers.

Standard length (4 ft) **£6** Extra long (6 ft) **£9**

We can supply leads to any required length.

RS232 Cables available in any length and any combination. Please telephone for your requirement.

PRINTER RIBBONS & VARIOUS DUST COVERS

Type	Ribbons	Dust Covers
RX100/MX100/FX100	£10.00	£5.25
FX80/MX80	£4.50	£4.95
RX80	£4.50	£4.50
GP80	£4.50	–
GP100	£4.95	£3.95
GP250	£5.95	£3.95
KAGA KP810	£5.95	£4.75
CANON PW1080	£5.95	£4.75
MICROVITEC MONITORS	–	£5.50

Our attractive Dust Covers are manufactured from translucent PVC. The seams are stitched and edges are taped to prevent splitting due to continuous use.

VOLTMACE DELTA 14 JOYSTICK SYSTEM

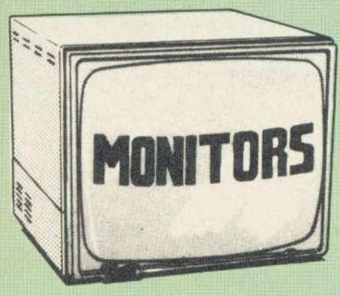
The Voltmace system provides full facilities for connecting the Delta 14 handset.

Delta 14 handset – On its own makes a high quality centre sprung analogue joystick with fire buttons **£12.50**

Adaptor Module allows use of two joysticks and provides hardware to access all the keys on the keypad of the joystick **£12.55**

Transfer program allows use of the keypad keys and joystick to simulate any key on the keyboard. This works by creating a machine code patch that stays in memory while another program is loaded in. Allows any game to be used with joysticks. Supplied on disc or tape.

Tape **£5.10** Disc **£7.95**



We stock a range of monitors to suit all needs. Choice of a monitor is a matter of personal taste so we recommend that whenever possible, you ask for a demonstration at our shop.

MICROVITEC

- 1431 – Medium resolution as used on the BBC television computer programme **£175**
- 1451 – High resolution, suitable for word processing in mode 0 .... **£237**
- 1441 – High res. exceeds the capabilities of the BBC micro **£385**
- 1431AP RGB + PAL and AUDIO **£199**
- 1451AP RGB + PAL and AUDIO **£285**
- Dust Cover for Microvitecs **£5.50**

All Microvitec Monitors are 14" RGB in their distinctive right angle sturdy metal case or the new beige plastic case. They are supplied complete with connecting lead to the BBC and a 3pin mains plug.

KAGA

- KAGA KX1201G Hi-res Green Monitor **£90**
- KAGA KX1202G Ultra-Hi-Res Green Monitor **£105**
- KAGA KX1203A Ultra-Hi-Res Amber Monitor **£105**
- KAGA Vision 2, Hi-Res, RGB Colour Monitor **£225**
- KAGA Vision 3, Ultra Hi-Res, RGB Monitor **£310**

All KAGA monitors are 12" units housed in a professionally finished beige plastic cabinet. They all have as standard, a genuine etched anti-glare screen.

ZENITH

12" high resolution monochrome monitor. Ideal for word processing as its green or amber screen is very restful to read. The high resolution makes it good for games too – you can really see the detail that has been put into the graphics **£66**

LEADS

BNC Lead for Zenith or Philips **£3**
RGB lead for KAGA **£5**

N.B. Carriage on Monitors **£7** (securicor)

NEW

ROM-SPELL



ROMSPELL is the new fast Spelling Checker ROM from Watford. Packed with excellent features, ROMSPELL is probably the most advanced spelling checker available for the BBC micro.

Features include:

- 30,000 word dictionary
- One pass check
- Two pass check
- Ambiguous word check
- Basic access to ROMSPELL
- Immediate entry check

ROMSPELL is fantastic value at **£25**

(Please specify 40 or 80 tracks when ordering)

BBC MICRO WORD-PROCESSING PACKAGE

A complete word-processing package (which can be heavily modified to your requirements, maintaining the large discount). We supply everything you need to get a BBC micro running as a word-processor. Please call in for a demonstration.

EXAMPLE PACKAGE
BBC Model B, Watford Electronics' DFS upgrade, WORDWISE ROM, Twin 400k Epson drives in beige, Zenith 12" Hi-resolution monitor (Green or Amber), Brother HR15 daisywheel printer. Gemini software: BEEBCALC spreadsheet, analysis and DATABASE software on disc. 10 × 3M disc, 500 sheets fan-fold paper, 4 way mains trailing socket, manuals, all leads and BBC carrying case.

NEW LOW PRICE

Only £999

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24 Hours

THE EPSON RX/FX/KAGA PRINTER COMMANDS REVEALED

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX/KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English how to use your printer (Kaga KP810, Canon PW1080A, or any other Epson FX-80 compatible printer) with the BBC micro, both from Basic and your Wordwise wordprocessor.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

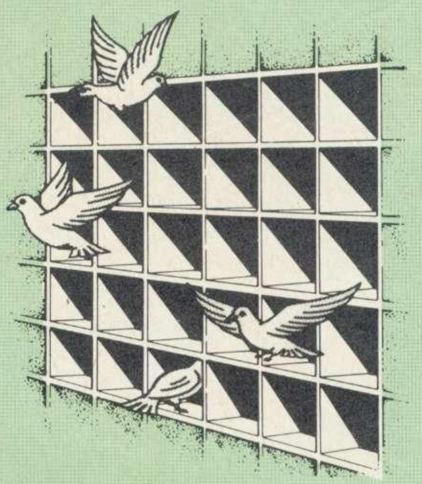
This book is superb value at only **£5.95** (Book – No VAT)



This Light Pen for the BBC micro is packaged in a neat pen shape with built in switch. Supplied complete with our sophisticated Pen-Pal software on cassette (see elsewhere in this ad).

Only **£23**
(For software on disc please add £2)

DATABASE MANAGEMENT SYSTEMS



DISCDATA

Discdata is an entirely disc based database handling system. It is extremely easy to use through its comprehensive menu system. The simplicity is such that we do not feel the need to provide explanation on use in the written guidance supplied with the program. The first-time database user will rapidly become familiar with this package designed throughout to be simple and obvious.

On disc at **Only £17**
(Please specify 40 or 80 track when ordering)
(Please write in for technical specifications)

FILE-PLUS

The File-Plus package is even more powerful and flexible than Disc-Data. It is also largely menu driven but has its own command language for file searching. The 16K ROM contains all the normally required routines, with lesser used options supplied on the utilities disc. All input and output formatting is controlled through screen forms. A full screen editing system is used to define a form which allows tremendous flexibility in the format in which your data is displayed. It is very easy to change from form to form so that you can type in your data with one form, and examine it with others. You will typically design several forms before starting to access the database so that you can quickly and easily see the fields of each record that you want to appear in the layout you decide on. The form system is also used for output to your printer. File Plus has a unique file linking system that allows the entire on-line storage of your system to be used for one database. This can give around 1.5 Megabyte databases using dual drives and double density.
The built in FQL (File-Plus Query Language) can be used for searching the database. Presented in the form of a powerful command language with looping facilities etc. this allows the most flexible access to your data possible. Full arithmetic operations are provided to allow the system to be used for statistical analysis.

Cont.

Operations supported are –, +, *, /, +–999999 9999.9999 and compare facilities =, >,<>>=, >=, <, &,.
Many keywords are supported by the language: assign, compare, display, and, goto, iff, ift, print, read, search, spool and update.
Supplied with a very detailed 70 page manual to explain all the facilities with many examples.

Only £43

(Please specify 40 or 80 tracks for the utilities disc)

DATAGEM

Gemini's 24K ROM based DATABASE Management System
Special Offer: **£85**

Continued →

Watford Electronics will be launching a range of exciting NEW PRODUCTS at the forthcoming Acorn User Show. To whet your appetite and give you some early information on these new products, we have compiled the short descriptions given below. Call in at our stand for a demonstration on any of these products.

The DELTA CARD

Fourth Generation BBC Hardware Representing new standards in economical computing power, the Delta Card is the latest in fast 6502 'processor' boards for the BBC micro. Speed increases of upto 100% are fully supported by an additional 48k of fast RAM (16k sideways and 32k for screen overlay). The Delta Card transforms your BBC into a far more powerful system with FULL compatibility with ALL standard programs.

16K SIDEWAYS RAM MODULES

These novel units each provide 16K of fast dynamic sideways RAM. Due to novel design methods, more than one of these may be fitted to your BBC, allowing you to add units as and when you want.

Le MODEM
The MODEM from Watford

At last a professional MODEM for the BBC Micro. Unlike other 'Modem packages' this is a complete package there are no extra software costs to get 'up and running'. Of course Le MODEM is multi-standard, i.e. 300/300, 1200/75 UK and BELL (USA) are all supported.

The features that make Le MODEM such good value are:

- A complete communications terminal that transforms your BBC Micro into a very powerful World/wide data transfer system.
- Auto Dials, Auto Answers, Auto Baud selects and is completely controlled by your Micro. There are no external controls!
- Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICRO LIVE (BBC TV database), CITY BB and more.
- Designed to be SIMPLE but SOPHISTICATED. To LOGON to a data base all you have to know is its TELEPHONE NUMBER, Le MODEM does the rest.
- Supplied with a comprehensive telecomms package in a 16K sideways ROM which includes a FULL PRESTEL terminal allowing TELESOFTWARE to be downloaded.
- A comprehensive 80 column terminal. This includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!
- FULLY controlled by simple '*COMMANDS allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!
- Connects to the 1MHz bus. A *AUDIO ON/OFF command allows you to actually hear the telephone line through your BBC micro loudspeaker.
- Completely self contained with internal mains power supply. (Even a free mains plug is fitted!) A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.
- Packaged in such as way that you need nothing else except a BBC Micro to communicate with computers all over the world.

The NEW ROM/RAM board from Watford for all serious BBC users!

This second generation of ROM/RAM board combines the best of both the sideways ROM and RAM worlds into one advanced unit. When plugged into your BBC, this board offers the ability to use up to 8 standard sideways ROMs, 16K Battery backed up static RAM (used one of the sideways ROM options) and up to 128K of dynamic sideways RAM. All the RAM has both write protect and read protect. Of course, such an advanced board as this, does not require any soldering or flying leads; all that fitting involves is removing the CPU from its socket and replacing this into a special socket on the ROM/RAM board and then simply plugging in the ROM/RAM board.

Watford's REAL TIME CLOCK Unit

The RTC from Watford is a new product designed for the hobbyist and programmers alike. Powerful and comprehensive software supports the RTC itself. It has battery backup to maintain both the time and the date when power is removed from the unit. Interrupts can be generated to occur after specific times to allow the programmer great flexibility.

Just look at the features this unit offers!

- Connects to 1MHz bus.
- Address location adjustable.
- Year, month and day stored.
- Hours, minutes, second and tenths of seconds stored.
- Battery backed up.
- Extensive controlling software in ROM.
- Provides an additional 'User Port'
- Detailed manual.
- Timed interrupts.

Watford's Z80 SECOND PROCESSOR

Probably the most advanced Z80 Second Processor available for the BBC Micro. This powerful addition to a BBC system utilises our own DDFS controller to allow the Z80 to accept discs from a large variety of CP/M formats, including:

- Acorn
- Epson QX-10
- IBM PC
- Newbrain 40
- Osborne 2
- RML 480Z
- Superbrain
- Xerox/Crememco
- British Micro Mimi
- IBS Magnum
- Memory 8013 CPM
- Newbrain 80
- Osborne 2
- Sharp MZ80K
- Televideo
- Transam Tuscan

Solve your compatibility problems with the Watford Z80 Second Processor.

The ULTIMATE DFSs for the BBC MICRO

WATFORD TOPS THE DFS CHART

Watford's Ultimate DFS has scored highest points in ACORN USER's unbiased DFS's Review of July 1985.
In concluding, the reviewer writes "It must be said that Watford's DFS certainly offers a comprehensive range of facilities at a very attractive price".
To celebrate the occasion, we are offering Watford's complete Disc Interface Kit at £65 only.

Just compare the features:

Features	Acorn 1.20	Watford Single Density	Watford Double Density
Max nos. of files per disc side	31	62	62
Max disc capacity	800k	800k	1440k
Tube compatible	Yes	Yes	Yes
Built-in Editor	No	Yes	Yes
Built-in Formatter	No	Yes	Yes
Built-in Verifier	No	Yes	Yes
MRUN a file	No	Yes	Yes
MLOAD a file	No	Yes	Yes
Extended RENAME	No	Yes	Yes
Selective COPY	No	Yes	Yes
Default file name	No	Yes	Yes
Disc space distribution	No	Yes	Yes
40/80 Software Switchable	No	Yes	Yes
Wide catalogue	No	Yes	Yes
Close open files	No	Yes	Yes
Improved OPENOUT	No	Yes	Yes
Copy between densities	N/A	N/A	Yes
OSWORD &7F	Yes	Yes	Yes
Full entry point compatibility	Yes	Yes	Yes
Retain information over a break	1.20 partial	1.42 Yes	1.52 Yes
Games compatibility	Yes	Yes	Most
Econet file server	Yes	Yes	Yes
Econet station	Yes	Yes	Yes
Full wildcard facilities	No	Yes	Yes

WATFORD's & ACORN's SINGLE DENSITY DFS

Watford's popular and widely acclaimed DFS has now been available for two years, and has gained a large following amongst serious users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade.

PRICES

- *Complete Disc Interface Kit incl. DFS ROM & fitting instructions* **£65**
- *Acorn's DFS Kit complete* **£70**
- *DFS Manual (Comprehensive)* *(no VAT)* **£6.95**

(P.S. Our comprehensive DFS Manual covers both Acorn & Watford DFSs)

- *Watford's sophisticated DFS ROM only* **£16**
- *We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only* **£12**
- *Watford's DFS is exclusively available from Watford Electronics. Every ROM carries a special label with our LOGO and serial number.*

WATFORD's DOUBLE DENSITY DFS INTERFACE

The DDFS from Watford Electronics represents a new standard in DFSs for the BBC micro. This is a double density version of our popular single density DFS, and combines all the features of this powerful DFS with the advantages of a system that gives 80% more storage per disc in double density mode. P.S. – Please note that not all DDFSs are capable of providing either the full 80% storage increase, or of allowing a file the full size of the disc – Ours allows both of these!

The typical piece of games software these days is provided upon a protected disc. In order to work on any double density system (including the others on the market) a protected piece of software needs to make calls through the OSWORD &7F routines. To ensure compatibility, the Watford DDFS features probably the most comprehensive and powerful 8271 emulation ever written for a double density system.

PRICES

- *Complete DDFS Kit incl. fitting instructions* **£79**
- *DDFS Manual* *(no VAT)* **£6.95**
- *We will exchange your existing Single Density for our DDFS Unit at* **£40**

Quality Disc Drives from Watford Electronics

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates the single density capacity. The double density storage capacity is second one, (that within the brackets). All disc Drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track and which are 80 track. The 40 track ones are manufactured by EPSON, the world famous Japanese company, (non-tinted boxes). The 80 track drives are famous MITSUBISHI drives (tinted boxes).

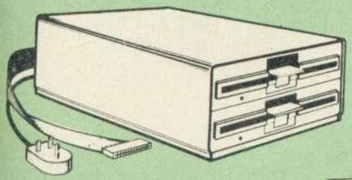
With two prices in a box (e.g. £295/£299), the first price is for the standard drive and the second for the same unit in switchable type. Users of either of the two Watford DFSs will not need switchable drives as their DFS will provide software switching for them. Users of Acorn's DFS will find that they need to pay the extra for switchable drives if they wish to use 40 track discs in an 80 track drive.

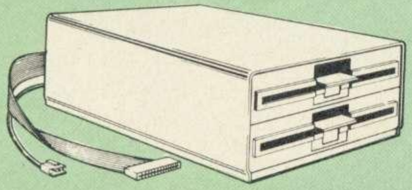
The drives we supply are fast (3ms track to track, 15ms settle), quiet and have a low power consumption (average well under 1 amp). Extensive experience of the usage of disc drives suggests that the MITSUBISHI and EPSON drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.
Various other "manufacturers" of disc drives for the BBC micro (more accurately, "packagers" label other manufacturers drives with their own name). We buy the high quality Epson and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

Names you can trust, at prices you can afford!

If you look around the popular BBC micro press, you will find that the prices we quote are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.
Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate: extensive tests within our workshops have confirmed this. All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. (Ideal for Schools & Colleges. All single disc drives with power supply, (i.e. CS100, CS200 & CS400S) are supplied in a twin case with twin data cable for later inclusion of a second drive). At Watford we anticipate your needs of tomorrow not just today!

All disc drives advertised here will operate in double density mode with the appropriate interface and software.





Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
100K (180K)	CLS100 £85		CS100 £110	
200K (360K)	CLS 200 £86	CLD200 £165	CS 200 £110	CD200 £180
400K (720K)	CLS 400 £120 / £120 CLS400S	CLD 400 £165	£135 CS 400S	CD400 £185
800K (1.44M)		CLD800 £230 / £240 CLD 800S		£259 CD 800S

● TWIN drive CASE, with Power Supply & Cables **£35**
Securicor carriage on Disc Drives £5

Prefix C = Cased Drive
L = Less PSU
S = Single
D = Double

Suffix S = 40/80 Switchable

e.g. CLS400S = Cased drive, Less power supply unit, Single 400K, Switchable (40/80 track).

MYSTERIES OF DISC DRIVES & DFS REVEALED

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

For instance, what is the difference between single and double density formats, how can you use a 40 track disc on an 80 track disc drive? What is the difference between a DFS and disc interface kit? Should you acquire a single Disc drive or twin? What does 48 TPI and 96 TPI discs mean? These are just a few of the questions you may have asked yourself and never found the answer or maybe you have yet to encounter these questions.

Now the mystery of buying a suitable interface and disc drive for your BBC micro is revealed in Watford's new book entitled 'MYSTERIES of DISC DRIVES & DFS REVEALED'. It describes in fine detail, yet remaining very readable to the beginner, how disc drives operate, the type of interfaces available, which type of discs to use on a disc drive and how data is stored on the discs.

£5.95 (Book No VAT)

3M – 5¼" DISKETTES

Top quality 3M – SCOTCH Diskettes from Watford Electronics (Your 3M Appointed Distributors). All our discs carry a lifetime warranty. These discs are quiet in operation and insert positively with their reinforced hub rings. Boxes of 10 supplied complete with self stick disc labels and write protect tabs.

DON'T SETTLE FOR LESS, BUY THE BEST

- *10 × S/S D/D 40 Track Diskettes* **£13**
- *10 × D/S D/D 40 Track Diskettes* **£18**
- *10 × S/S D/D 80 Track Diskettes* **£22**
- *10 × D/S D/D 80 Track Diskettes* **£24**

QUALITY DISKETTES at KNOCK DOWN PRICES

To complement the range of quality discs and disc drives that WE already sell, WE are now supplying some special offer packs of 10 high quality discs, each with a life-time guarantee. These are supplied packaged in an attractive plastic library disc box to protect them from damage.

10 × M4 S-S D/D 40 Track Discs **£11**
10 × M5 D/S D/D 40 Track Discs **£15**
10 × M7 D/S D/D 80 Track Discs **£20**

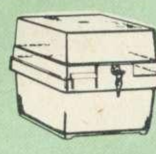
DISC ALBUMS

Attractively finished in beige leather-look vinyl, these conveniently store upto 20 Discs. Each Disc can easily be seen through the clear view pockets.

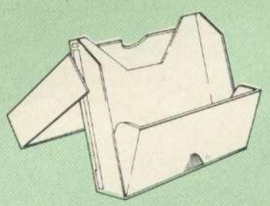
£4.25

LOCKABLE DISC STORAGE UNITS

Strong plastic case that afford real protection to your discs. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.



M35 - holds upto 40 discs **£12**
M85 – holds upto 95 discs **£15**



PLASTIC LIBRARY CASES

FOR 5¼" DISC STORAGE holds 10 Discs. **£1.80**

FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use.

£8

DUST COVERS (For our Disc Drives)

Single (without PSU) **£3.20** Twin (without PSU) **£3.85**
Single (with PSU) **£3.25** Twin (with PSU) **£3.90**

Continued →



Impress your friends and business colleagues with the quality of your letters and printed material with Watford's very simple to use EPSON NLQ! (Near Letter Quality) ROM. Suitable for FX80, RX80, RX80F/T, FX100.

Look at the features:
- Simply type *NLQ80/100 and a single VDU code to use NLQ print.
- NLQ is then available without any modifications from BASIC, WORDWISE, VIEW (with NLQ DRIVER) or virtually any other program or language.
- Single codes select PROPORTIONAL type (yes even on the RX80); ENLARGED type; UNDERLINED type. These features can be used seperately or in any combination.
- Full UK character set; Standard 'pica size'; Proportional spacing; Enlarged; Underlined; Normal type.

The NLQ ROM is supplied complete with comprehensive manual.

P.S. NLQ ROM is compatible with the Torch Z80 system and can be used from within the Perfect Writer software.

Only: £22

VIEW PRINTER DRIVER for NLQ ROM

This specially written printer driver has been designed to allow View access to the full features of our NLQ ROM.
A must for all VIEW and NLQ ROM users.

£7.00

NEW LAUNCH

THE NLQ DESIGNER

The Kaga Taxan KP810 and KP910 are two superb printers, as our many thousands of satisfied customers would surely attest to. One of it's particularly strong points is the NLQ option that it offers; perhaps one of the more weaker points is the effort required to design your own custom NLQ font.

Well the solution is here NOW in the shape of Watford's NLQ DESIGNER ROM! This powerful piece of software allows easy design and entry of a full NLQ font, with further fonts recallable from disc. Once a font has been programmed with the versatile NLQ DESIGNER, it can be saved to disc, downloaded to your Kaga (or Canon) printer, or even programmed into an EPROM (given the appropriate hardware) and then plugged directly into your printer so that it is available immediately when you turn it on.

A 40/80 track format disc containing 3 example fonts is included in the package.

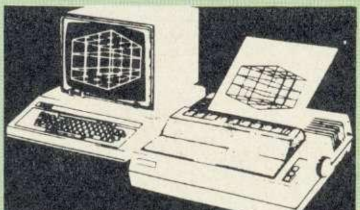
(P.S. This ROM is not suitable for Epson printers as they don't normally have NLQ ability. Keep reading our adverts though – work is in development!)

NLQ DESIGNER & FONT DISC **£25**

INDIVIDUAL Preprogrammed FONT ROMS **£15**

(Please write in for further details on both the NLQ DESIGNER and the individual font ROMs available.)

DUMPOUT 3



A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including all Mode 7 facilities etc. We have to admit that there is one facility that we cannot replicate – if anyone can supply flashing ink we would like to know!
The ROM also provides window setting utilities and two new OSWORD calls that allow mode 7 graphics pixels to be read and plotted using the standard graphic co-ordinate system. The latest version includes a graphic dump trigger for dumping screens from games whilst they are running.
Two commands are used to operate the dump routines:
*GIMAGE – This provides a full graphics dump of any graphics mode, plus modes 7 and '8'. There are many optional parameters but you need only specify the parameters you wish to change.

Features available include:
- Vertical and horizontal scaling through all the graphic modes and mode 7
- Rotation of the image produced through 90, 180 and 270 degrees
- Left hand indentation setting
- Screen dump window definition
- Colour grey scaling
- Two tone fast dump
- Special colour mask
- Mode 7 contrast expansion
- Mode 7 contiguous dump
- Key triggered dumps
- User port switched dumps

What does the independent press say!

Practical Electronics, May 1985
"The Dump Out 3 ROM from Watford Electronics represents one of the most sophisticated types of printer dump utilities available for the BBC Micro . . .".

"an extremely sophisticated and powerful dump utility".

"VERDICT – Dump Out 3 ROM has all the facilities which you are ever likely to need for producing printer dumps. The facilities available work extremely well and if printer dumps are something which you require, then this ROM can be recommended to help you to get the best out of your dot matrix printer".

The Micro User Feb. 1985.
"Well, here is that winner"!

"provide(s) some rather sophisticated screen dumps. Producing high resolution paper copies of graphic screens in any (graphics) mode will be the major reason for buying this ROM, and this is where Dump Out 3 performs PAR EXCELLENCE". (Our capitals for their italics.)

"The versatility of *GIMAGE (the graphics dump command) when using these parameters is amazing. Pictures of almost any size, shape, contrast or distortion may be produced without the need for a reducing photocopier or trick photography".

"Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC micro. It is easy to use yet highly versatile, and caters for all BBC screen modes in multitone high resolution printing. Whole, partial, rotated and scaled screens may be dumped to almost any BBC compatible dot matrix printer (see our list at the end of this advert). At £24 it must represent excellent value for money and surely cannot be beaten".

Designed for use with the following printers: CP80, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, LPVII, NEC PC8023, DMP100/120/200/400, etc. etc.
Price including comprehensive manual

£24

SPARK DUMP ROM

A screen Dump ROM for the Acorn/Olivetti Spark jet printers. Works in modes 0/1/2/4/5/7. Does vertical & Horizontal scaling. Positive & Negative grey scaling.

Only: **£12**

VIEW

VIEW WORDPROCESSOR
We are supplying the new VIEW version 2.1 allowing printing of memory contents etc **£46**

HI-VIEW

A special version of VIEW designed for use with 6502 2nd Processor. Available on disc, it offers 47K of text memory.

£49

VIEWSHEET (Acornsoft) **£49**

Watford's own Sophisticated VIEW PRINTER DRIVER for Epson FX80 & KAGA KP

Only £9

VIEW DRIVERS FOR JUKI & BROTHER PRINTERS

Only £8

VIEW/VIEW SHEET PRINTER DRIVER for SILVER REED

(Officially approved by Silver Reed)

A range of VIEW Printer drivers to complement the Silver Reed range of printers EXP400/500/550 & 770 EB 50 and converted typewriters EX43/44 & 55.

Only: £8

BEEB PRINTER ROM



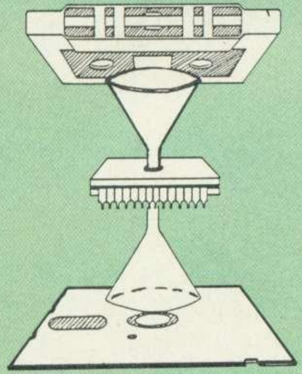
This utility ROM is designed to simplify using all the facilities of your printer. It has many facilities:
★ Selection of printer modes such as underline, font and size is by 'Single Key' operations.
★ From Wordwise, a single number following OC will select a mode rather than a long and incomprehensible string of control codes. This makes using your printer with Wordwise much more convenient.
★ When using Basic (or other languages) you can have control over the formatting of the output to the printer in the style of a wordprocessor. You can define page top, bottom and side margins etc. with intelligent page skip for binders an option. All supported printers will now respond to form-feed etc. commands.
★ User defined characters are printed as you see them on the screen so that non-standard characters are automatically printed out correctly.
★ Commands select the options for the following printers:
GP100, STAR, NEC, MX/FX, KAGA, LP/VII/DMP100, DMP200.
Operates with either parallel or serial interfaces.
★ Supplied with a 50 page manual that is very comprehensive and easy to follow. Please specify printer type when ordering so that we can send the correct function key strip.

Price: £24



TRANSFEROM

(Tape to Disc Utility)



After months of top secret development, we are now able to supply details of this advanced and sophisticated utility ROM for the BBC micro. Just look at the features:

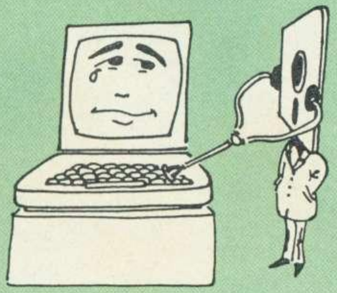
- Fully menu driven for ease of use
- Copes with locked programs
- A very comprehensive built in copying features
- Copies very long adventure games
- Supplied with comprehensive manual

TRANSFEROM is now available in BOTH single and double density versions. The single density version works with both the Acorn and Watford single density DFSs. The double density version works with the Watford DDFS system only.

TRANSFEROM takes your software on tape and saves them onto disc. TRANSFEROM does not stop when one disc is full; you just insert another disc in and carry on with that one! Surely this is the most valuable investment you could make if you have tape software that you wish to transfer to disc! Please specify version required – Single or Double Density.

£22.00

DIAGNOSTICS DISC



The BBC micro is a very complex machine and thus diagnosing a fault can be very difficult. Until now, the only way to discover the nature of a fault was either to find a competent friend with a large degree of patience or to find your nearest dealer and pay him to find out what is wrong.

At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.

The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:

RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.

This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £15.00

ROMAS

THE CROSS ASSEMBLER AND MACRO EDITOR FOR SERIOUS PROGRAMMERS!



ROMAS is a carefully designed, sophisticated yet simple to use, development system for serious assembly language programmers. Using the BBC as the development system, you can choose your target system from the following processors:

6502, 65C02, Z80, 8085, 8041, 6809 and Z8 P.S. This includes the Acorn 6502 & Z80.

ROMAS features a powerful expression analyser, making complex table easy to generate. To aid in documentation, fully formatted assembly listings may be produced, with full symbol table output at the end.

ROMAS is provided with a powerful cross referancer to produce a listing of all the labels in a given "source" program; this makes it easy to check to see if you are about to duplicate a label.

The Macro Editor

Features of this powerful editor provided with the ROMAS package include:

- Works in all 40 and 80 column screen modes
- Fast load and save speeds
- Continuous line and column number displays
- Search, replace and move; all available in macros
- Command repetition

The ROMAS package includes a comprehensive manual, providing detailed documentation and plenty of examples.

A give away at . . . **Only £45**

Please specify 40 or 80 track disc when ordering.

Special Offer

Purchase a copy of ROMAS and our EPROM programmer (retail price £113.00), and we'll give you the very special price of:

£99.00! (£4 p&p)

ULTRACALC 2

The mark 2 version of the BBC Publications extremely popular electronic spreadsheet ROM.

Only: **£66**

NEW LAUNCH

DELSYS

Digital Electronic System

The DELSYS project introduces the BBC Micro user through a structured approach to the fundamentals of microcomputer hardware design. For the first time an opportunity to grasp and understand the importance of Digital Electronic Systems in control applications is offered to owners of the BBC Micro. This is achieved by tackling a set of hardware project packs of varying degrees of complexity.
Introductory packs will educate users in the fundamentals of digital circuits by using practical experiments. A easy to understand manual explains the constructor, the operations and procedures in a step by step guide to basic design principles.
The first of the DELSYS project packs introduces the user to the concepts of logic gates, fundamental chip selection from technical data sheets, interfacing and bus structure techniques using the construction of a set of "Traffic Lights" as an example.

Call in for a demonstration on our stand at the Acorn User Show.

ROM MANAGER

'Provides comprehensive management of all your installed ROMs – BEEBUG Nov. '84'.
This ROM is unique in its capabilities. It allows you, the user, full control over the BBC Micro's sideways ROM paging system with simple to use commands. This ROM is essential for those with several ROMs. At a simple level ROM MANAGER can be used to remove the problem of clashing command names and allow full use of all the facilities of your ROMs. This is coupled with facilities to completely enable or disable various ROMs in the machine including ROM manager itself.
ROM MANAGER can also be used to develop sideways ROMs using the machine's standard memory. This is achieved by sending sideways ROM calls to your code in RAM, saving the expense of fitting sideways RAM for ROM development purposes. ROM status reports are also given by the ROM, including ROM lengths, checksums, entry points supported and current filing system title.
The ROM also provides facilities to examine ROMs, list function keys for editing, modify RAM (using a HEX/ASCII editor) and list ROM titles neatly and concisely.

Price **£20**

DISC EXECUTOR

Disc Executor is a sophisticated disc utility for the transfer of your programs from cassette to disc. It copes with 'locked' files and full length adventures (up to &6E blocks long) and programs that load below &E00. Disc Executor is simple to use and provides menus to prompt the user along the way. Disc Executor will cope with the vast majority of tapes. (Please note that Disc Executor is not compatible with double density disc interfaces – keep reading our adverts though!)

Price only **£10**

(Please specify whether 40 or 80 track disc when ordering)

THE INVESTIGATOR

This sophisticated Utility program on disc, enables you to make security back-up copies of most of your valuable Disc Software. Makes full use of all 8271 (will not run with double density DFSs) facilities to discover the precise format of your protected disc so that an exact copy can be produced. Supplied with detailed instructions. Please specify 40 or 80 track disc when ordering.

Only **£20**

Continued →

NEW LAUNCH

Le Modem

At last the complete communications package from Watford Electronics. Le Modem is a fully automatic modem, No Knobs, No Switches. Capable of 300/300, 1200/75 UK and Bell (USA) operation. Le Modem Auto dials, Auto answers and Auto Baud selects by using the latest technology in its design. Le Modem includes: The Modem, a 16K ROM to control it, a comprehensive manual, a FREE disc software and of course all the leads you need. Even a FREE mains plug. Le Modem, the Prestel terminal, the BT Gold terminal, the ultimate Communications terminal for the BBC Micro for Business or Pleasure. Le Modem brings information technology as close as the phone.

Call in at our stand, at the Acorn User Show for a demonstration.

Nightingale Modem

Now Watford brings you PACE's NIGHTINGALE MODEM PACKAGE including the popular Commstar ROM software for the BBC Micro. Nightingale is considered to be by far the most versatile BT approved modem available at the price for the BBC Micro. It is ideal for home or business use. It offers Prestel/Viewdata baud rates (1200/75 & 75/1200) as well as 300/300 baud full duplex for communication between BBC and other computers, including bulletin boards. A bargain at our

SPECIAL INTRODUCTORY OFFER

(Price includes COMMSTAR ROM & comprehensive manuals) **£119**

Nightingale Modem without software	**Only £99**
COMMSTAR ROM package only (P&P on modem £2.00)	**£29**
Auto Dial/Auto Answer Board	**£48**
Auto Dial Utilities Disc	**£9.50**
OBBS Bulletin Software	**£20.00**

DEMON Modem Package

Price: **£69.95** (Carr. £3)

Auto dial software disc **£4.25**

(Please specify 40 or 80 track)

(Note: Demon is not BT approved)

BEEBMON

Watford's own Machine code Monitor ROM written by Andrew Bray (Cambridge), co-author of the BBC Micro Advance User Guide.

BEEBMON is the most powerful and versatile machine code monitor from Watford Electronics. BEEBMON offers some superb features specially designed to make the task of understanding and debugging machine code easier; indeed BEEBMON is probably the only product with sufficient power to aid in the debugging of such complex pieces of software as a DFS. Offering a total emulation mode, BEEBMON can be used to single step through code anywhere in memory. All breakpoints are emulated and the workspace is totally relocatable, allowing for the simulation of all those "awkward" pieces of code.

Superb value for money at only: **£24**

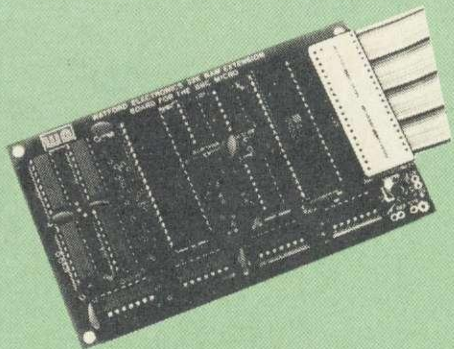
DISASSEMBLER ROM

Discover the hidden secrets of BASIC and the OPERATING SYSTEM with this easy to use progammers tool.

ONLY **£18**

Please write in for technical details.

32K RAM- PRINTER BUFFER EXPANSION BOARD



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.
- In "VIEW", type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.
- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This superb product is recommended by Computer Concepts for use with both Wordwise and Wordwise Plus. We wholeheartedly agree with this commendation.
- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.
- Use the FULL 32K or the bottom 12K of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Print large text files while running long graphics programs and have all your buffer options available as well (*FX15,21,138,145,ADVAL etc).
- Ensure COMPATIBILITY with a vast range of hardware (including Watford & ATPL ROM boards, double density boards, second processors), and software (including BASIC, TOOLKIT, VIEW, WORDWISE (1.20+), WORDWISE-PLUS). This is because our board, unlike those of our competitors, is connected to the computer by a ribbon cable.
- Achieve EASY OPERATION with ROM based software. A large range of commands is available for machine code and BASIC users, including some useful *HELP messages.

Offer price

Only: £60

(Price includes a comprehensive manual and the ROM)

GRAPH PAD

With this popular British Micro's Graph-pad, you can add new dimensions to your computer enjoyment. It helps you to create your own application programs by the simple use of the Graphpad. Ideal for Educational use. Supplied complete with Cables, Manual and a two program cassette.

SPECIAL OFFER **£86**

BEEBFONT ROM

BEEBFONT is a remarkable and different concept in BBC software supplied on a 16K ROM. It allows you to display text on the screen in 13 different styles:

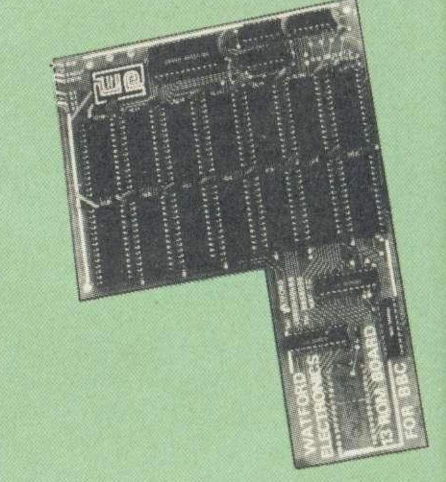
It works in modes 0, 1, 2 and 4 using the full colour capabilities of each mode. Characters are printed in the same way as normal. Selection between the various fonts is very easily achieved with Ctrl-V – press this followed by a font number and the output will continue in the new font. Beebfont ROM is particularly useful in display work with the characters produced at twice the normal size.

You can create your own character fonts with the editor supplied. You can also print-out pre-formatted text files using the special characters with Epson FX, RX and NEC printers. The full range of character styles can be used, controlled from within the text. The editor and spooler program are supplied with the package, on cassette or disc. The spooler allows word processor (Wordwise & View) output to be printed in the new characters.

A twenty page manual is supplied. Please state printer type and media for the editor & spooler when ordering (cassette, 40 or 80 track disc).

ONLY **£32**

Mk-2 13 ROM SOCKET EXPANSION BOARD



Now all lines fully buffered – On board battery back-up facility – will now accept EPROMS 2716, 2732, 2764 & 27128 and ROMs 6116 & 6264.

Simply plugs into one of the four ROM sockets currently available in BBC Micro. There are only 5 solder connections to be made. Full instructions are supplied. Unlike other ROM Boards, this board has been ergonomically designed to enable the user, easy further expansion inside the Micro, e.g. Double Density Board, Torch Board, RAM Card, etc., without any clash. (At Watford, we think ahead).

Our Mk2 13 ROM Socket Board enables the User to increase the sideways ROM capacity from the basic 4 sockets upto full 16 capable of being supported by current operating systems. In addition the board is designed with the facility to hold upto 16K RAM, which when switched into operation is automatically selected by any WRITE signal to the Sideways ROM area. This gives the User the ability to write a utility or language and upon pressing break have the utility or language up and running (new ROM software can be developed and tested in situ.)

The Board gives the User, plenty of freedom to explore the possibilities of the new paged ROMs due in the coming months and offers them the chance to develop their own.

All lines are fully buffered and the board meets or exceeds all timings for operation in the BBC Microcomputer.

Supplied ready-built and tested complete with fitting instructions.

Only £30

PCB NI-CAD Battery for ROM Boards.

£2

COMPUTER CONCEPT'S ROMS

CARETAKER Basic Utility	**£28**
Graphics ROM	**£28**
Disc Doctor ROM	**£28**
INTER-SHEET	**£49**
TERMI	**£27**
COMMUNICATOR	**£58**
SPEECH ROM	**£25**

Wordwise

Without doubt a very sophisticated piece of software for the BBC Micro. It has all the features of a professional word processor yet is easy to use.

SPECIAL OFFER THIS MONTH: **£32**

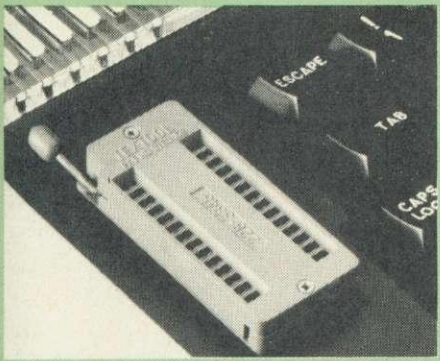
WORDWISE PLUS

Now available from stock **£47**

WORDWISE PLUS UPGRADES

Existing users of Wordwise can upgrade to WORDWISE + for **£19.** Please return the old WORDWISE package complete with Chip and MANUAL with your remittance and we will send you the new WORDWISE + package.

SIDEWAYS ZIF SOCKET



Now Watford Electronics brings you a ROM board for small budgets or for those of you who do not wish to open up your Micro frequently. It allows you to change ROMs quickly and efficiently with the minimum of effort – no screws to loosen or keyboard to remove. The unit consists mainly of a zero insertion force (ZIF) socket on a small circuit board which is located into the position of the 'ROM Cartridge' and is connected to one of the internal ROM sockets via a ribbon cable.

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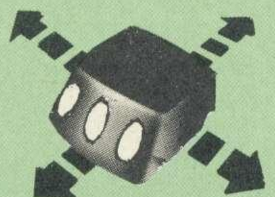
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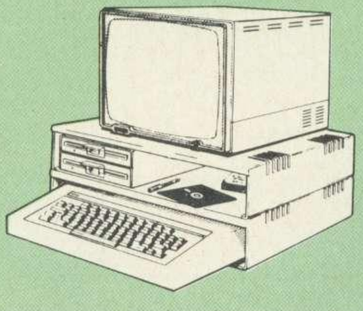
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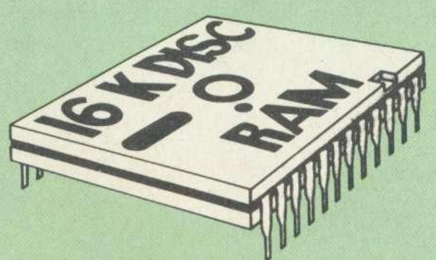
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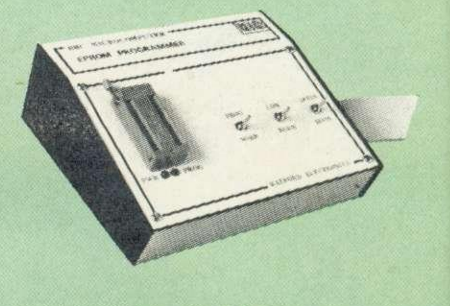
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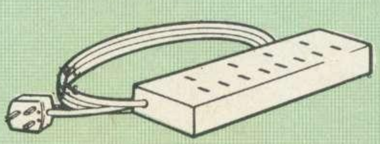
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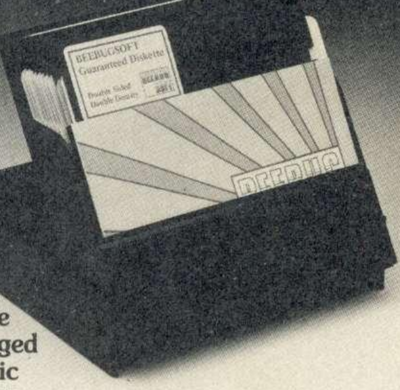
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AND SO FORTH

Dick de Grandis-Harrison looks at a DIY language and describes how you can go Forth and add

ILLUSTRATION BY JOHN CLEMENTSON

Forth is an extensible language, so it can, in a sense, be argued that it has no disadvantages – if you find a feature that you don't like, or one that's missing, you can modify the language to match your requirements. The fact that such problems can be overcome is one of Forth's greatest strengths – although you may consider it a weakness that they exist at all. Ultimately, it is you who must decide whether or not you like Forth's approach.

A recent article in *Acorn User* (March 1985) explained the basic principles of Forth, such as its use of stacks and the definition of a Forth 'word'. The examples given here are written in Acornsoft Forth but should be easily adaptable for other implementations on the BBC micro. If you are using fig-Forth, replace VARIABLE by 0 VARIABLE and CREATE by <BUILDS.

Forth is truly a DIY language – it provides you with a toolkit for making things, rather than presenting you with a finished and inflexible product. Most versions of Forth lack certain facilities that would be considered essential in, say, Basic. For example, it is unusual

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Listing 1. Defining an ordinary variable in Forth

```
SCR £ 21        15 H
  ( VARIABLE )


  : VARIABLE                    ( creates ordinary variables )
      CREATE 0 ,
      DOES>  ;
```

for Forth to be supplied with the ability to handle manipulation of text strings. Initially it only recognises numbers and defined Forth words – from then on, it's up to you.

One missing word that often causes difficulty is the equivalent of Basic's INPUT keyword. How, for example, would you write the Forth equivalent of:

```
10 INPUT N
20 FOR I = 1 TO N
30 PRINT I
40 NEXT I
```

The Forth solution to this problem is that you do not need INPUT at all! A definition that will do the same job is:

```
: COUNTS ( n... )
  1+ 1 DO
     I.
       LOOP;
```

The upper limit for the loop is assumed to be on the stack before COUNTS is used. Type, for example:

```
7 COUNTS
```

to see it working. This approach means that a specific INPUT word is rarely needed but you can, of course, easily define one:

```
: INPUT (??? . . . ???)
  QUERY INTERPRET ;
```

This definition is much more powerful than in Basic since it uses Forth's interpreter. With it you can input numbers, type Forth commands, or even make a definition of a new word, so use it with care. Since it can do anything, I have carefully avoided stating its action in respect of the stack contents.

In direct contrast with the previous example, the philosophy behind Forth is that each word should have a precisely defined action. It should do as little as possible to achieve its desired result. As an example, take the arithmetic words, +, *, etc. In Basic an arithmetic expression is handled by an evaluator. This must scan the whole expression, where necessary calculating and storing intermediate values, before combining them into the final result.

Forth has no such evaluator. Instead, each Forth arithmetic word takes values from the stack and leaves its own result. It has no knowledge of what has happened before or of what will happen next. It is your responsibility to make sure that the right values are present at the right time. Forth uses you, the programmer, as its evaluator.

It is this type of approach that makes Forth fast, by removing the complicated decision-making that is needed by many other languages. Incidentally, the need for values to be present before the word which uses them leads naturally to Forth's use of RPN (Reverse Polish Notation). It is not just that RPN is more logical and elegant, nor that Forth enthusiasts wish to confuse the uninterested. It's simply that RPN results from simple actions for arithmetic words, keeping Forth compact and fast.

It is, at least in part, this simplicity of the action of a word that is responsible for the large number (typically 200-300) of words present in a Forth system. In a language such as C the arithmetic operators can work with all allowed types of number. If used on numbers of mixed types they may even make an automatic type conversion for you (but usually not the one you want). In contrast, each Forth word will generally only work with one type of number. For example, + will add two single-precision (two-byte) numbers. If you want to add two double-precision (four-byte) numbers you must use a different word; D+. Some words, generally distinguished by the prefix '2' eg, 2DUP, can act on either a double number or two single numbers. Words designed to act only on double numbers have the prefix 'D'.

The desire for simplicity can also be seen in the way variables act. In other languages the position of a variable in an expression determines whether a value is taken from it or put into it. In Forth a variable always leaves the address of the location where the value is stored. The tasks of reading or writing a value at this location are separated into two other words, @ (fetch) and ! (store). Thus the equivalent of Basic's:

```
10 LET X = Y + Z
```

would be

```
Y@ Z@ + X!
```

Forth's flexibility does, however, mean that you can break the rules if you want. Many people feel that @ and ! destroy the readibility of Forth programs. They can be largely eliminated by defining a new type of variable, known as a TO_VARIABLE, which normally leaves its value, rather than its address, eliminating the need for @ to get at the value. A value is stored in such a variable by using the word TO before its name. If X, Y and Z were TO_VARIABLES we could write the previous example as:

```
Y Z + TO X
```

which is certainly much clearer.

A way of defining such variables is shown in listing 2 – compare it with a similar, but simpler, definition for the more usual type of variable (listing 1). The two definitions illustrate that we

Listing 2. Defining TO_VARIABLES makes programs more readable

```
SCR £ 22        16 H
  ( TO VARIABLE EXAMPLE )

  VARIABLE FLAG                        ( ordinary variable )

  : TO  1 FLAG ! ;                     ( sets the flag )

  : TO_VARIABLE
      CREATE 0 ,
      DOES>  FLAG @ IF     !           ( store if flag set )
                         0 FLAG !      (and reset flag )
                   ELSE @              ( fetch )
                   THEN ;

  TO_VARIABLE X                        ( example of use )
```

gain in clarity of expression at the cost of increasing the complexity of the action of a variable.

Forth has been described as a Write-Only language. It is certainly easy to write Forth programs that are incomprehensible to read. One reason is Forth's use of the stack for passing values from one word to another. Such values are not explicitly visible in a listing. If they are then manipulated by complex combinations of stack words such as DUP, SWAP, ROT and DROP, the resulting program is often very difficult to disentangle.

Forth programs need not be unreadable – we've already seen one example of a way of improving their clarity. Judicious use of variables, careful choices for the names of words, using a sensible layout and including lots of explanatory comments are some of the ways you can ensure that you can still understand your program the week after you wrote it.

Although some implementations of Forth, particularly those for the newer 16-bit computers, are provided with floating point arithmetic operations, the majority use only integer arithmetic, which is not so great a limitation as it might appear. It's always possible to approximate a number by a fraction, ie, a ratio of two integers. Thus, the value 0.527 can be written as 527/1000. Forth provides arithmetic operations specifically designed to deal with this type of situation. The most generally useful of these words is */ which, in one operation, multiplies two numbers together and divides by a third. To see how this might help, let us use it to multiply a number by the value of pi. A simple approximation for the value of pi is the fraction 22/7. We could multiply, for example, 132 by pi like this:

```
132 22 * 7 /
```

or

```
132 22 7*/
```

Of course, the result is only approximate, but we could obtain greater accuracy by using a fraction that is a better approximation to pi, such as 3142/1000 or 355/113. The word */ will give an accurate result in situations where separate use of * and / would produce a wrong value. The reason is that */ holds the intermediate product as a double number, so there is no danger of the overflow error that would normally result from multiplying two large numbers.

Let us look at an example of how we might use */ to solve a real problem. Suppose you want to calculate the equivalent resistance, R, of two resistors, of resistance R1 and R2, connected in parallel. The basic formula for the calculation is:

$$1/R = 1/R1 + 1/R2$$

This is not much help since in integer arithmetic one divided by two (or any value greater than one) will give zero. An alternative way of writing the same formula is:

$$R = R1 * R2 / (R1 + R2)$$

so we can find the result by multiplying the two values and dividing by their sum – a perfect case for the use of */.

A suitable definition is:

```
:// (R1,R2 . . . R)
   2DUP (make another copy of both
         R1 and R2)
   +     (stack is now R1, R2, R1 + R2)
   */ ;
```

For example, to calculate the resistance of a 40 kilohm resistor in parallel with one of 60 kilohm, type:

```
40 60 // .
```

which will print the result, 24 (kilohm). If your version of Forth does not have 2DUP you can define it as:

```
: 2DUP OVER OVER ;
```

It may require some thought in order to

Listing 3. A program in Acornsoft Forth to draw random-size, random-colour triangles

```
SCR £ 30      1E H
 ( BASIC GRAPHICS )   DECIMAL

 : DRAW ( y,x,k ... )
    25 >VDU  >VDU
    DUP >VDU    >< >VDU
    DUP >VDU    >< >VDU ;

 : MOVETO ( y,x ... )
    4 DRAW ;

 : FILL_TRIANGLE ( y,x ... )
    85 DRAW ;

 : TRIANGLE ( y3,x3,y2,x2,y1,x1 ... )
    MOVETO  MOVETO  FILL_TRIANGLE ;
 -->

SCR £ 31      1F H
 ( GRAPHICS RANDOM NUMBER GENERATOR ) DECIMAL

  VARIABLE SEED

 : (RAND)   ( ... n )
    SEED @  113 *  99 +
    ABS
    DUP   SEED ! ;

 : RAND ( range ... n )
    (RAND)
    32767 */ ;
 -->

SCR £ 32      20 H
 ( RANDOM GRAPHICS ) DECIMAL

 : COLOUR ( n,k ... )
    18 >VDU
    >VDU >VDU ;

 : RANDOM_COLOUR  ( ... )
    4 RAND   4 RAND   COLOUR ;

 : RANDOM_TRIANGLE  ( ... )
    6 0 DO   1024 RAND   LOOP
    TRIANGLE ;
 -->

OK
33 TRIAD

SCR £ 33      21 H
 ( TRIANGLES )  DECIMAL

 : TRIANGLES  ( ... )
    5 MODE
    BEGIN
      RANDOM_COLOUR
      RANDOM_TRIANGLE
    AGAIN ;
```

work out how to tackle a particular problem with only integer arithmetic, but the result will generally be faster than a solution using floating point arithmetic. This is yet another example of how Forth uses the programmer to do part of the work.

To show how the principles described in this article can be applied to a longer program, listing 3 (in Acornsoft Forth) will draw randomly sized and coloured triangles, using the BBC micro's VDU25 graphics command.

DRAW uses the Beeb's VDU25 statement, and is equivalent to the PLOT command in BBC Basic. The value of k determines the nature of the command – to plot a point, to draw a line, to move to the specified position, or to fill a triangle.

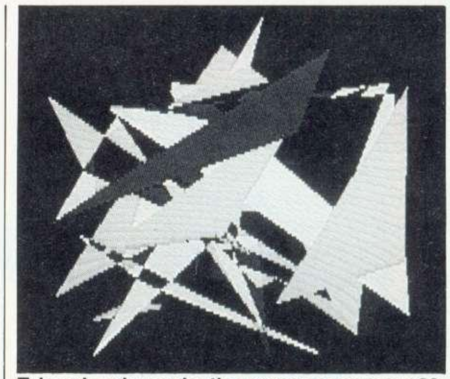
The Acornsoft Forth word >VDU sends the low order byte of the top stack value to the VDU driver. If your Forth does not have such a word you could, for this example, use EMIT. The x and y co-ordinates must each be sent as two successive bytes, with the low order byte being sent first. The word >< exchanges the high and low order bytes of the top value on the stack. If it is not present in your Forth you can define it as:

```
: >< (hilo . . . lohi)
    DUP 256 *
    SWAP 256 /
    + ;
```

Note that, in MOVE, the x and y co-ordinates and the value of k are in the reverse order to that required in Basic. This presents the values in the correct order for sending to the VDU driver. It also allows the definition of more specific words, such as MOVETO, and FILL_TRIANGLE, without any need to rearrange the values on the stack.

Screen 31 contains a simple pseudo-random number generator. The word (RAND) calculates each new value from the previous one, stored in the variable SEED. These values will lie in the range 0 to 32767 inclusive. This value is converted to lie between 0 and the required maximum by the word RAND – another use for */.

Screen 32 defines COLOUR as the equivalent of a VDU18 statement. RANDOM_COLOUR selects a random plot mode in the range 0 to 4 and a colour in the range 0 to 3 (suitable for a four-colour mode such as mode 5). RANDOM TRIANGLE draws a triangle within a square of side 1000 pixels.



Triangles drawn by the program on page 69

In the final screen of the example, the word TRIANGLES selects mode 5 before entering an endless loop to plot triangles of random sizes, colours, and styles. Press the Escape key to stop it.

I hope this has given you some of the feel of programming in Forth. If you want to know more, I suggest you try it for yourself – there is no real substitute for first-hand experience.

For reviews of three Forth products see pages 181 and 183.

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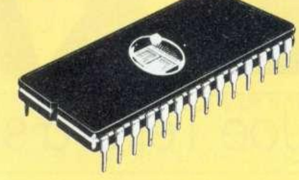
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SHINING EXAMPLE

Joe Telford sheds some light on communicating with a torch



THE gong attached to the robot arm attached to the micro in charge of telephone communications at Telford Towers sounded the alarm. It could only be the Editor himself on the line at that moment. Avoiding the robot arm which was now attempting to place the gong to my ear, I picked up the phone.

'OK wise guy,' quoth the Ed, 'this month we're really going to fix you. We've got an issue on communications and guess who's going to cover comms with a torch.' Gazing into my crystal ball told me not to look too far for the answer. 'And by the way,' he continued, 'the whole project has to be within the pocket of the average reader!' He rang off, and after a brief tussle as the robot arm tried to replace me on the phone cradle, I wandered off to one of the labs.

Before beginning work, I jotted down a diagram of the overall system I intended to create (figure 1). It comprises a transmitting station which is a BBC micro (any B series) with a torch connected to its cassette relay, as well as a receiving station, a Beeb connected to a light-dependent resistor.

A trip to town provided me with all the components for the system (table 1). Surprisingly, there were a great number of torches to be had at different prices – the one I decided on was a Sonca hand torch with a prefocus bulb. It ran from two 1.5v pencells and looked easy to convert to the task in mind. In addition it cost a mere £1.08.

I needed some 3-way flex to connect the terminal block to the 15-way D connector, but I had some spare ribbon cable which I salvaged from the junk box. I also needed a resistor, but these are cheap (about 3p) and I already had a number available.

The next stage towards solving my problem was to design the hardware part of the system. The torch was easier than I thought. Starting with a general circuit diagram (figure 2), I produced the actual layout (figure 3). Readers preferring to use a different torch should follow figure 2 and solder across the switch on their torch.

The torch I used might have been designed for the task – I attached the lead to it without soldering and, with a little cutting with a craft knife, the torch body held the lead securely.

The last stage was fitting the DIN plug (figure 4). It is important to use only the top two connections here, so that the battery is not connected to the BBC micro cassette circuitry. Once the DIN plug was reassembled and the torch put together with batteries, this part of the system could be tested as follows:

1. Switch on and off at torch switch (light should go on and off)
2. Short the two pins at the DIN plug with a paperclip (light should go on and off)
3. Plug torch into cassette port:

Type *MOTOR 1 (light should come on)
Type *MOTOR 0 (light should go off)

I then turned to the reception sensor (figure 5). Here the light dependent resistor (LDR) and a resistor are used as a potential divider to place a voltage on ADVAL 1 of the receiving BBC micro. If the light on the LDR becomes brighter, the voltage (and hence the ADVAL number) rises, while if the light level decreases, so the voltage and matching ADVAL number falls. The only difficulty here is in matching the LDR to the resistor. I decided to measure the resistance of the LDR in a typical shaded room (daylight with the blinds half drawn) and then selected a resistor which matched. I ended up with a 10Kohm resistor: readers might wish to experiment here. The actual wiring diagram (figure 6) should be followed and then checked as follows.

Connect the D connector to the analogue port of a micro and enter:

```
 10 REPEAT
 20 PRINT FNldr
 30 UNTIL FALSE
100 DEF FNldr = ADVAL1 DIV 256
RUN
```



As the program runs, observe the numbers generated. For best results point the light sensor away from any light source so it is measuring ambient lighting. Once the readings stabilise, cover the LDR with your hand – the readings should drop. Remove your hand, and the readings will return to normal. Shine a light on the LDR, and the numbers will rise.

Problems and cures

1. If the reading moves randomly or not at all, the wires from terminal block to the D connector are wrong at the D end – re-check.
2. If the reading is permanently at 0 or 512 check the software. If it's OK, check the D connector for solder shorting extra pins or for one lead not soldered to the correct pin (probably Vref or 0v).
3. If the numbers rise at low light levels and fall at high levels, reverse the Vref and 0v leads at the terminator block.

Once the transmitter module and receiving module were built, the next stage was to test things out. I used a simple program to send a pulsating light beam from the transmitting (TX) computer:

```
10 REPEAT
20 TIME=0
30 *MOTOR 1
40 REPEAT UNTIL TIME>=20
50 TIME=0
60 *MOTOR 0
70 REPEAT UNTIL TIME>=20
80 UNTIL FALSE
```

As I had the LDR test program still in the receiving (RX) machine, I simply ran that program. The result was pleasing: a list of numbers which varied between high and low in sync with the flashing torch. I had established communications, but the system I had developed was about as far removed from message transmission as the grunts of primitive man are from speech.

I had been expecting greater problems with the LDR, as these devices are slow to respond to changes of light levels and also respond to other sources of light. However, provided the main room lighting was constant and not directed at the LDR, the results were quite impressive. I could detect the changing numbers over spaces of one metre in daylight, extending to four metres in shade, and even greater distances in the dark. These intervals could be improved in open shade by fitting the LDR into a tube to narrow its angle of acceptance.

Readers are recommended to get the system going at a short distance, and then experiment by widening the gap – the more remote, the more critical is the focusing and aiming of the

torch beam. Another improvement in the distance of transmission would be to use a more powerful torch, with say a 4.5 or 6 volt battery. Experimentation is the keyword here.

Hand torch	£1.08
1.5v pencells (× 2)	£0.72
1 metre twin flex	£0.20
7-pin DIN plug	£0.35
15-way D connector	£1.34
ORP12 light dependent resistor	£0.97
3-way terminal block	£0.15
Total	£4.81

Table 1. Joe's expenses claim

Hardware problems

Because of the simplistic approach to hardware, the actual signals transmitted differ from those expected (figure 7). The majority of problems occur with either the cassette relay, the torch bulb or the LDR.

The cassette relay is a mechanical device, and so takes a finite time to open and close. The faster the open/close time, the less reliable the relay becomes, because of switch bounce. Also the relay contacts cannot take a powerful source of current, so (for example) a car headlight could not be switched by them. The main limitation, then, is one of timing. I eventually decided on an on to off ratio of 1:1 with each part lasting for 0.1 second.

The torch bulb itself causes two problems – it takes time to light up, and time to extinguish. This thermal inertia degrades any signal pulse sent from the torch. The LDR is also slow to change resistance, and it further degrades the signal.

The obvious difficulties with signal degradation and change of timings meant that it was important to examine the signal input to the RX computer via the LDR, so I developed a simple program:

```
10 MODE4
20 x=0
30 REPEAT:x=x+4
40 TIME=0
50 REPEAT UNTIL TIME=>1
60 DRAW x,FNldr*2
70 UNTIL x > 1280
80 END
90 DEF FNldr=ADVAL1 DIV 256
```

Altering line 50 affects the x-scale of the graph and line 60, the y-scale. In terms of examining the effect of signal transmission this was useful, but a more general-purpose program was required, and so I designed the *Acorn User* Light Grapher (listing 1 on yellow pages), a user-friendly extension of the program.

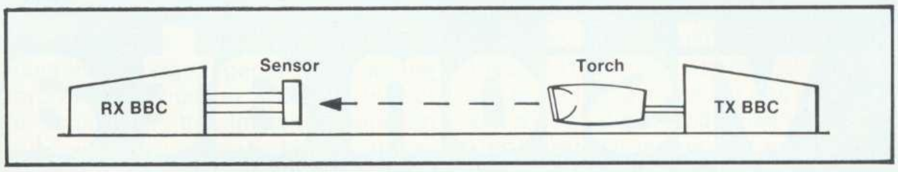


Figure 1. The original idea for the system

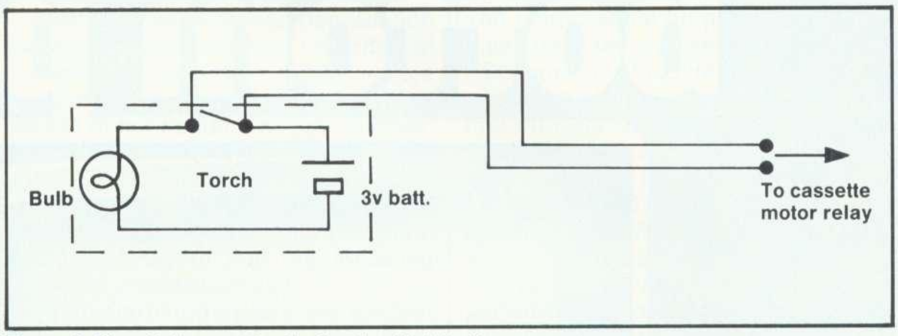


Figure 2. Circuit diagram for the torch, which led to . . .

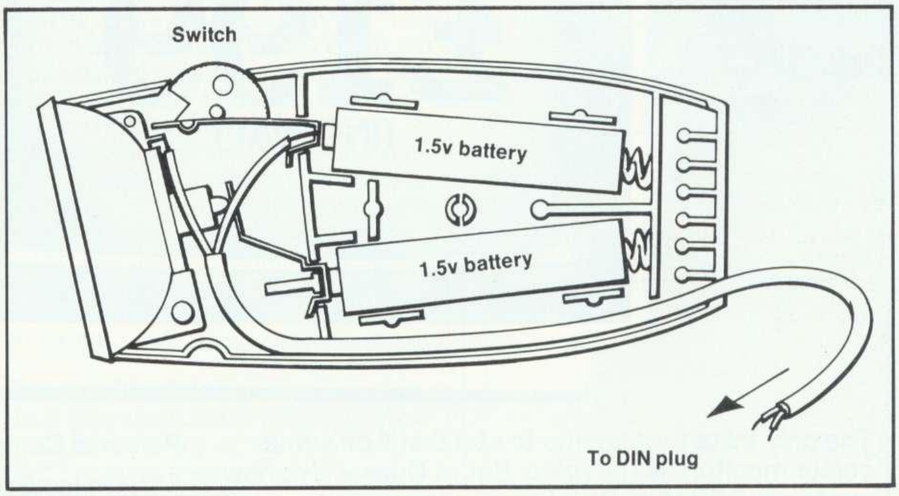


Figure 3. . . the actual wiring layout

Using the graphing program

Once the program has been entered and saved to disc as RXGRAPH, type RUN and press Return. The screen clears then the title appears, and underneath it is an on-screen function key overlay. Between these items is an area of screen which fills with a graph-like grid of squares and then clears leaving only axes, marked in regular units. A dotted line marks the range of FNldr values normally available. Within the graph area is some information on scales and line colour.

Because the program is single-key operated, each valid keypress causes a beep and some screen action. All keypresses can be from the function key row, and their effects are as follows:

f0 clears the graphing area
f1 draws a line paying attention to both scales and the value of the light level
f2 sets the line colour as red
f3 sets the line colour as white
f4 sets the line colour as blue
f5 sets the scale to 2 (doubles the time taken to cross the screen)
f6 resets the x scale
f7 sets the y scale to 2 (doubles the resolution)
f8 resets the y scale
f9 exits the program (not shown on screen)

A typical graphing session might use these keypresses:

RUN

f1 Draw a white graph line
f7 f4 f1 Double y scale: Draw a blue graph line
f0 Clear screen

Inside the program

The program runs in mode 1 and can be converted for use with the BBC B+ shadow RAM by using mode 129 in line 50. This would enable experimenters to log data and re-examine it. The main body of the program lies between lines 50 and 140. The main parts being PROCsetup, PROCcrsr, PROCscreen, PROCfkeys and the REPEAT UNTIL loop embodying PROCcommand.

PROCsetup sets the ADC to convert only one channel, then selects eight-bit

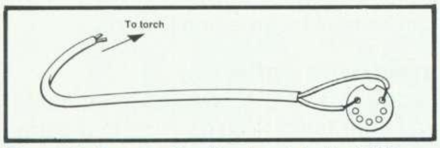


Figure 4. Connecting the torch to the DIN plug

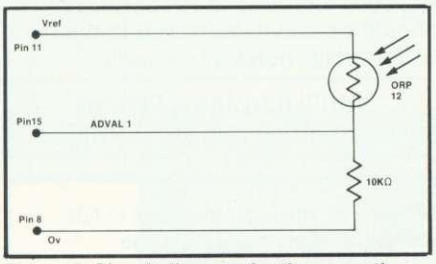


Figure 5. Circuit diagram for the reception sensor

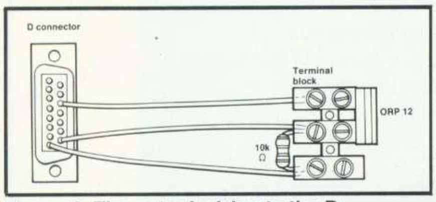


Figure 6. The actual wiring to the D connector

accuracy. Next the scales x% and y% are set to one, the initial graph colour to white, and the command string for the single key commands is placed in v$.

PROCcrsr simply turns off the flashing cursor to improve screen layout.

PROCscreen initialises the screen, draws the text areas, and prints the title using PROCprint. It then calls PROCcoms which draws the function key strip, and finally calls PROCgraphaxis to draw the graph 'paper' and then clear the centre portion via PROCclg. PROCclg also prints the status information on line types and scales.

PROCprint is a standard library routine which prints double height characters in a mode other than mode 7.

PROCfkeys sets up the function keys to match the command string v$.

PROCcommand is entered continually until a valid key is pressed. This is detected at line 170. The appropriate routine is then called, after which the status panel is updated (line 290).

PROCdraw is the most important routine which behaves as follows.

First the function key strip is cleared, using PROCclscom, to remind users that commands are not appropriate. Next, a repeat loop is entered which draws a line across the screen at 1/100th second intervals, the increments across the screen being set by line 670 which is based on the value of the x scale. The height of the graph is based on the y scale in y% as shown in line 680. When the graph reaches the end of the screen, the drawing stops and the routine returns control to PROCcommand.

Design of the software system

This program meant that I could examine the signal generated from the torch and decide on a coding format for character transmission between micros. I considered Morse transmission, ASCII transmission and visible bar code format transmission.

Although I experienced degradation measuring ASCII signals, I decided to transmit in a derivation of MEP visible bar code format, because this had the benefit of not needing a look-up table. The difficulties involved in receiving a good transmission were basically caused by loss of bits, and so the method of transmission and reception had to guarantee that the following problems would be solved:

1. When starting transmission the first bit was received at a much lower level than any of the others (figure 7).
2. The sine-wave format of the degraded signal at the LDR could not be measured reliably enough to give an accurate direct ASCII bit representation in terms of time duration.
3. The loss of sync between TX machine and RX machine because of this degradation meant that it would be difficult to measure the length of a message.

The solutions to each of these required software that would transmit and decode a specially devised character format.

Transmitted data

Each character would be encoded to ASCII (see figure 8). Each bit would then be further encoded to a time value. For example a binary 1 would flash on for 0.2 sec while a binary 0 would flash on for 0.1 sec. In between the different periods of ons would be constant periods of offs (figure 8). A typical example might be the letter 'A' which would be decoded to 01000001, then, in terms of time slices, would become 12111112, and finally transmitted as 102010101010101020, where a 2 is a 0.2 sec on pulse, a 1 is a 0.1 sec on pulse and a 0 is a 0.1 sec off pulse (figure 9). This approach meant that every bit of an ASCII character could be recorded by waiting for a following 0 (or light off.) The length of the on periods could be measured and decoded back to pure ASCII and then to a character.

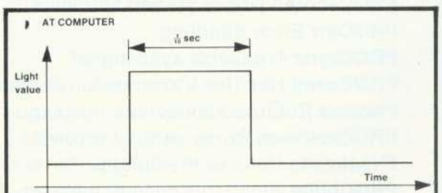


Figure 7. Pulse changes during transmission

To remove the problem of the low first bit I decided that every message would be prefixed with a start of transmission code (128) or 10000000 or 2010101010101010 which would be ignored by the RX machine other than for signalling start of transmission. The RX machine would have to count the on periods and store their time lengths. Because only the on times would be stored, the message would be correctly transmitted only if a multiple of eight bits was received. The end of message would be regarded as happening whenever a long off period occurred (ie, naturally at the end of transmission).

The final problem was to choose the values to be used by the decoding program for deciding whether the torch was on or off. The change of average

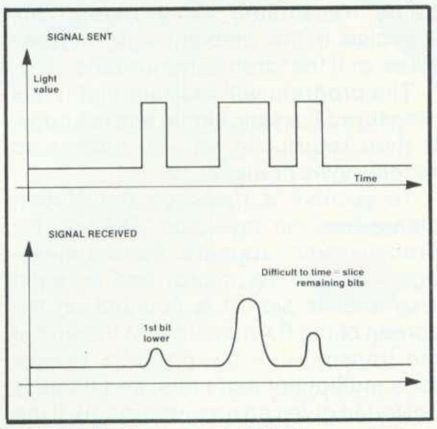


Figure 8. Problems with ASCII transmission

light level between a steady state with the torch off and a state with the light fluctuating meant that some form of synchronising signal would need to be transmitted prior to messages.

In order to make this as infrequent as possible I decided to have a facility on TX and RX machines for transmitting and measuring sync manually. Readers who need automatic sync can alter the programs to send and receive a sync signal before each message.

The programs are ideally suited to students exploring forms of communications in a co-operative way. The approach to using the programs is to load the torch transmitter into the BBC micro with the torch connected and the torch receiver into the BBC micro with the LDR connected. Run both programs

and follow the instructions below.

Torch receiver (listing 2) is the simpler of the two programs to use. First look at the layout of the screen. Notice the two panels which say SYNC and MESSAGE. Use the cursor keys shown between them to whiten the panel you want. Now press Return.

The lower portion of the screen will clear and the message 'Press space when sync signal is being transmitted' will appear. Start the Sync signal on the TX machine (see later) and press the space bar on the RX machine. The RX program will calibrate itself for the current average light level when a signal is being transmitted. Only repeat this exercise if the ambient light falls or rises, or if the torch batteries fade.

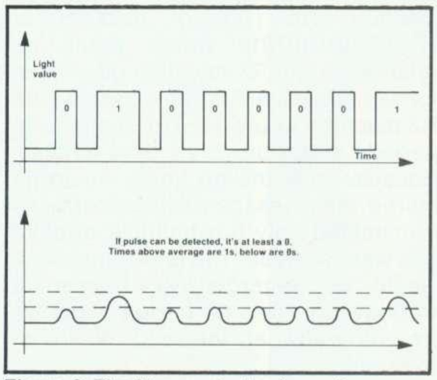


Figure 9. Final transmission format

The program will indicate that it has measured the sync signal and is happy. It then returns to let you choose to receive sync or message.

To receive a message the screen clears and the message: 'Waiting for Transmission' appears. Send a message from the TX micro, and as each character is sent it is counted on the screen of the RX machine. At the end of the transmission the program checks for a multiple of eight bits, and if this is not found gives an error message. If the transmission looks OK then it is decoded, always translating the first character as start of transmission (SOT). The message is then displayed and added to the message pad. The pad will scroll as new messages are added. The final stage is to return the user to choosing between sync and message, although as message is still pointed to, it can be re-accessed by simply pressing the Return key.

At any point, the Escape key returns the user to the choice between SYNC and MESSAGE.

The TX program (listing 3) is quite easy to use, but needs a little more thought. Run the program and select whether you wish to send a sync signal or a message, and press Return to confirm this.

When sending Sync the message: 'Transmitting Sync – any key to stop' appears and the relay clicks, the cassette motor LED should light and the torch flash. The transmission can be stopped with any key, Escape, or automatically after five seconds. When sending a message the two arrows vanish from between the sync/message boxes and two vertical arrows appear at the side of the standard message box. Using the up/down cursor keys selects one of the 11 standard messages for transmission. When the required message is selected, it can be sent by pressing Return.

Inside the software

Tables 2 and 3 show the procedures and their tasks. You can see that many routines are standard library procedures which are in frequent use. Studying the TX and RX core routines should be self-explanatory in the light of the design notes given earlier.

You'll find Joe's listings on yellow pages 100-105

PROCsetup Selects ADC characteristics and reserves space for message in bits
FNchoose Returns 0 or 1 depending on choice between sync and message
PROCscreen Draws screen and titles
PROCerr Error handling
PROCsync Receives sync signal
PROCstartsync Waits for space bar to indicate start of sync
PROCmeasure sync Handles the amplitude and period of the signal
PROCamplitude Finds average light level during torch TX
PROCperiod Finds time between light flashes
PROCendsync Waits for end of sync signal
PROCmess Handles message reception
PROCwsrx Waits for increase in light as SOT
PROCgetrx Times each bit and places it in memory
FNcheckrx Checks transmission for a multiple of eight bits
PROC decbits Chooses limit value of ASCII 0 bits
PROCdecbytes Converts time values in eight bytes of memory to one ASCII character. Loops to do this for all characters

Utility Routines
rxerr Prints 'Message Error'
FNldr Returns light level
FNblock Indicated MESSAGE or SYNC by overlaying white block
PROCprint Prints large message
PROCbig Prints individual large characters
PROCrect Draws rectangles
PROCclsinst Clears message area
PROCcrsr Turns off cursor

Table 2. What happens inside the receiver . . .

Line 10 Sets the basic on/off time
PROCsetup Sets up an eight element array (for eight bits in an ASCII word)
FNchoose Returns 0 or 1 depending on choice between sync and message
PROCscreen Draws screen and titles
PROCerr Error handling
PROCsync Transmits sync signal
PROCsend Handles transmission of message
FNmess Returns appropriate message
PROCsetmess Prints vertical arrows
FNselmess Returns the number (1-12) of message to send
PROChilite Highlights current message line
PROCnormal Normalises current message line
FNinmess Returns keyboard input message
PROCasc Changes a character to ASCII bits
PROCtxbyte Transmits an ASCII byte in the selected format

Utility Routines
PROCtx Sends a single bit
FNblock Indicates MESSAGE or SYNC by overlaying white block
PROCprint Prints large message
PROCbig Prints individual large characters
PROCrect Draws rectangles
PROCclsinst Clears message area
PROCcrsr Turns off cursor
FNgpi Keyboard general purpose input routine

Table 3. . . . and inside the transmitter

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DRAW YOUR OWN CONCLUSIONS

Make plotting easy with *Easyplot*, a sophisticated piece of graphics software from Martin Phillips

DRAWING on the BBC micro and Electron is made easier by a variety of software and hardware packages, ranging from the mouse and graphics tablet to paintbox-type programs. However, the hardware is often expensive while the software does not have the tracing ability of the tablets.

The program given here, *Easyplot*, attempts to provide the capabilities of both approaches (although it does have some limitations) and the package will be built upon in future issues to overcome some of the drawbacks – and it will be presented as an alternative to an overhead projector.

Easyplot is a graphics plotting package designed to work on the BBC micro and Electron which is suitable for both disc and cassette use. With discs, memory space becomes a problem, but a 6502 second processor can overcome this.

Rather than saving actual screens, *Easyplot* saves the drawing commands in a compressed form so that a complex picture can be saved as a short file.

The map of Africa shown opposite can be stored in just 2k on disc or cassette, and the *Acorn User* yacht takes only 400 bytes. This saves considerable time loading and saving pictures to cassette, and disc users can have up to 30 pictures on a disc.

By storing the commands, the picture is easy to edit at any time by simply clearing the screen and re-creating it step-by-step. Then an unwanted part can be deleted by moving the rest of the commands down. Another feature is the ability to copy part of the picture and draw it elsewhere on the screen. This command can be stored simply as a co-ordinate offset, with markers to indicate the start and end points of the picture file to be copied. It is possible to make such a move routine recursive: in other words, to move part of a picture containing a part already copied and moved.



The good ship Acorn User: the commands that draw it can be stored in just 400 bytes

With a large number of picture files on one disc a 'notice board' display can be produced which would cycle through a predetermined sequence of pictures, and such a program is provided. This leads on to a novel use for the program – to replace an overhead projector, which could prove invaluable in schools. Another program is included to allow pictures or 'vufoils' to be displayed in a predetermined sequence, with the possibility of overlays and jumping to another part of the sequence.

Saving commands makes it possible to manipulate the picture once drawn, leading on to a host of applications. One to be presented in *Acorn User* is a quiz program using pictures created on *Easyplot*. The pictures are reduced to a quarter size, allowing room for questions and replies.

If all this sounds too wonderful to be true, then I'd better examine the disadvantages. First, because the commands have to be saved as they are initially entered, memory space is required. Memory is at a premium for such a program as it can use graphics modes 0, 1 or 2, which themselves require 20k. The memory shortage also leaves little room for the program itself, and therefore the commands available are somewhat limited, and certain error detection features cannot be fully implemented.

A second disadvantage is that a picture can only be re-created if there is another drawing program to unpack the command sequence and re-create the command. This has been largely overcome by a single-line procedure to use in a program to load a picture file and draw the picture. The short picture

files load very quickly, hence the program is not disrupted using the pictures. It takes time for the pictures to be re-drawn, but at least something happens on the screen.

Many graphics packages use a command table or menu on the screen, but as this program uses the keyboard to enter print and to load and save pictures, it was felt better to rely on the keyboard for all entries.

It's possible to convert the program for a joystick, but with little benefit. A small text window is left at the bottom of the screen for the current command to be displayed.



The map of Africa, drawn with *Easyplot*, can be stored on disc or cassette in only 2k

To use *Easyplot*, first load in PLOT. If your tape recorder has a motor-control do not switch off when this first program loads as it chains PLOT2. When this has loaded you will be asked if you require user-defined characters (specially-created characters the size of a normal letter). Often it is useful to define small characters that are too small to draw directly using *Easyplot*, eg, when drawing diagrams with special symbols.

The PLOT program can handle up to 20 different user-defined characters. The method is almost the same if the character generator is used, the main difference being the need to load in the memory section which stores the character definitions.

On the *Acorn User* monthly listing cassette there is an example file of pre-defined character definitions which can be loaded in called 'CHSET' (see page 96 to order).

The character definer only holds 10 characters on the Electron. It will work with both cassette or disc machines. The characters are accessed using the function keys and the Shift or CTRL key.

A spare cassette will be needed to store the character definitions created. Once the character generator has been selected, there is the option of loading in a new set of characters, saving an existing set, defining a character or ending the definer.

When loading or saving a character set, the filename must be seven letters or less. A new character can be defined by pressing the Shift or CTRL key together with the function key to be defined. Any character already defined for that key will be drawn in the grid, so existing ones can be altered. The cross can be moved using the cursor arrows, and the pixel set or cleared using the space bar. The character will be drawn in the appropriate position in the table at the right in black.

When you're satisfied, the character can be saved by pressing 'S', and cleared completely by pressing 'C'. Once characters have been defined they should be saved to disc or tape. Tape users will find it better to store this character set on another cassette for the time being. Once saved, pressing 'E' will load the PLOT2 program. At this point tape users should put the original cassette in the recorder.

The character definer can be used not only to define characters for the *Easyplot* programs, but for other programs too. It re-defines characters from 128 on, and the file of definitions can be loaded in the same way.

Once PLOT2 has loaded, the screen will clear and the user will be invited to select a BBC graphics mode – modes 3, 6 and 7 are not drawing modes and will not be accepted. Once a mode has been selected, the screen will be ready for a command. A drawing area will be displayed, and the word 'Command?' will appear at the bottom of the screen. A small flashing cross, the cursor, appears in the middle.

To use any command, first position the cursor where you wish to start and press the appropriate command key. Instructions at the bottom of the screen will prompt you. The screen cursor indicates the current pointer position, and will disappear when any command key is pressed and only re-appear when the command has been finished. Apart from the Break and Escape keys, pressing a key not used for a command will have no effect. The program will accept commands in capital or lower-case letters, and normally the Return key is not needed.

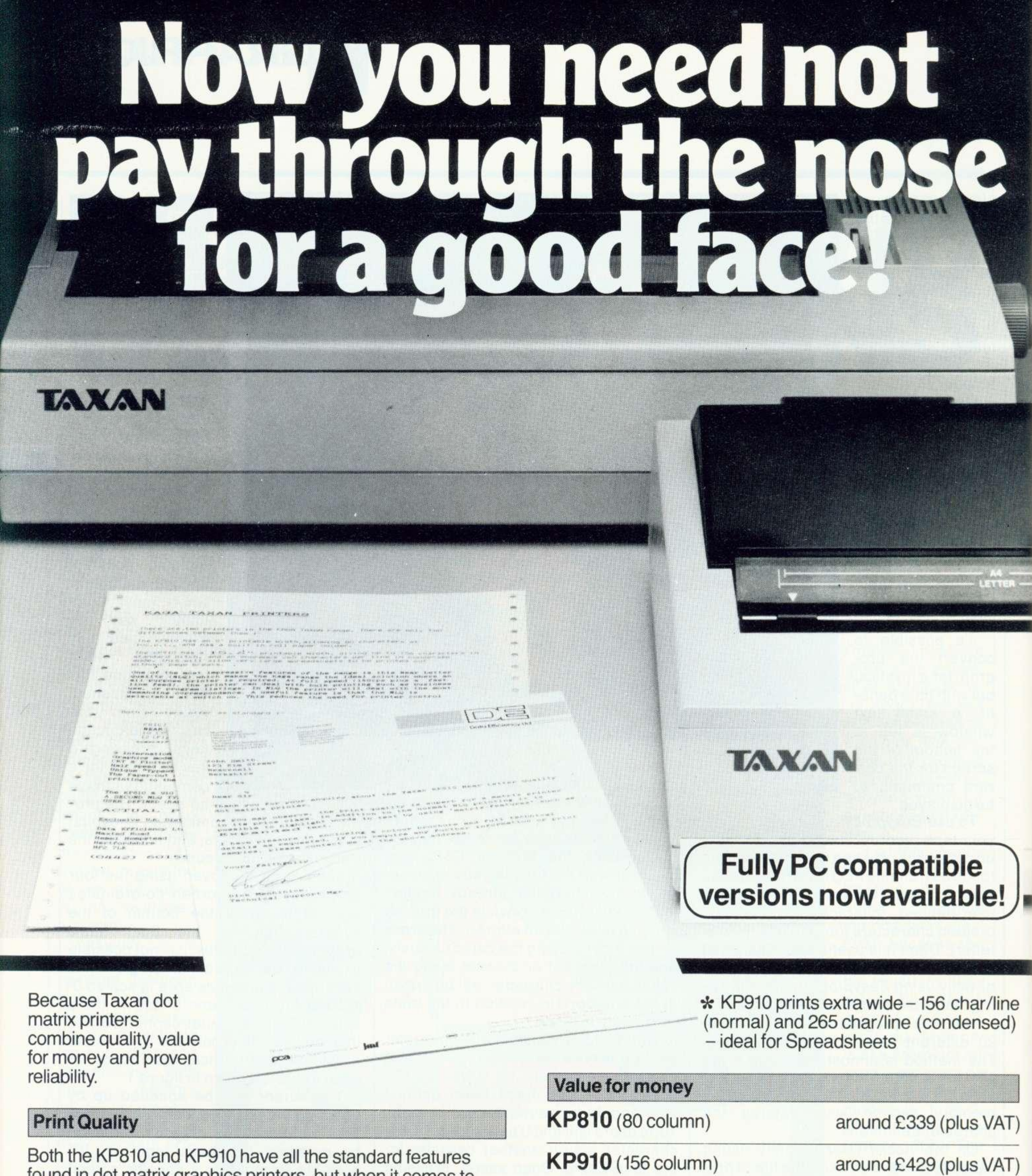
The cursor is moved using the four arrow keys. The screen co-ordinates are displayed at the bottom of the screen, and are the BBC Basic graphics co-ordinates. It is not possible to move the cursor in single units because the graphics area is scaled 0-1023 in the y axis and 0-1279 in the x axis, and the computer cannot work to this degree of precision. The actual horizontal and vertical resolutions for each mode are given in figure 1.

The cursor can be speeded up by pressing the Shift key at the same time. You can move in a diagonal direction by pressing two keys together. It's possible to move to a specific screen co-ordinate by pressing the Delete key. Then the x and y co-ordinates can be entered, and the cursor will move to that position.

It should be noted that when a shape is drawn or text is placed on the screen, it will only be drawn in the correct drawing colour when the position of the shape is finalised.

Commands

R . . . Draw a rectangle Move the cursor to one corner of the rectangle to be drawn and press 'R'. Now, as the cursor is moved, a flashing rectangle will be displayed on the screen. To 'fix' the



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rectangle, press the space bar. The rectangle will appear in the current drawing colour. A rectangle drawn with a dotted line is available.

L . . . Draw a line Move the cursor to one end of the line to be drawn and press 'L'. As the cursor is moved, a flashing line will appear. The line can be 'fixed' by pressing the space bar, and can be solid or dotted.

C . . . Draw a circle This key is somewhat misleading, as it will not only draw a circle but also any regular-sided polygon. Once 'C' has been pressed, the user is asked for the number of sides, and any number can be entered. Entering 1 will give a dot, 2 will give a straight line, and a number above 20 will effectively draw a circle in most modes. The centre of the polygon will be the cursor position when 'C' was pressed. The polygon will draw and undraw as the cursor is moved, and one vertex of the polygon will be where the cursor directs. Hence it is possible to alter the size of the polygon and rotate it to the desired position about its centre. It can be fixed by pressing the space bar. A small dot will be left in the centre of the circle or polygon to help draw concentric circles, or triangles. When the program is edited (or re-drawn because Escape has been pressed) this dot will disappear and will not be re-created when the picture is re-drawn.

F . . . Follow mode This is useful for drawing irregular shapes such as outlines of maps. It uses up memory quickly so must be used carefully. It might be better to select modes 4 or 5 if it is required extensively. The cursor is positioned at the start of the shape to be drawn and 'F' pressed. Now a line will be drawn on the screen as the cursor is moved. Follow mode can be stopped by pressing the space bar. The line is stored in sections, and only complete sections can be edited. This can be seen from time to time as the program halts and the message in the text window flashes for an instant.

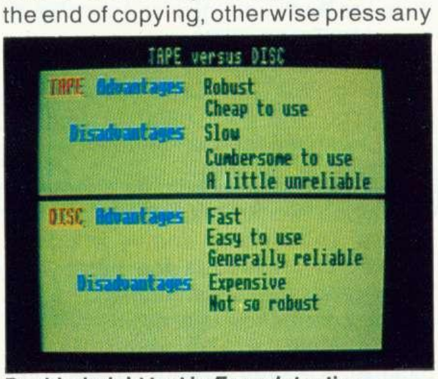
P . . . Print at Press 'P'. Labelling can then be entered in the text window at the bottom of the screen. It will be printed on the picture as a flashing image when Return is pressed and can be moved by the cursor. It is 'fixed' in the usual way by pressing the space bar, and will be printed in the correct colour. Before Return is pressed, the text can be edited using the Delete key.

A double-height lettering option is offered, as is the choice of horizontal or vertical print.

The pre-defined characters are accessed using the Print at . . . facility. Single or double-height, horizontal or vertical, can be selected. Characters can be accessed simply by pressing the appropriate function key together with Shift or CTRL. If an incorrect character is pressed, it can be deleted in the normal manner. The characters or words can be positioned by the cursor.

M . . . Move and redraw is one of the more complex commands. It allows the user to copy any part of the picture already drawn, then move it to another part of the screen and is very economical on memory.

The cursor is placed where the copied picture is to start drawing and 'M' is pressed. The screen will clear and the picture will be drawn step-by-step. At each step the prompt 'Start here' will appear. Press 'Y' at the step where copying is to start, otherwise press any key to continue stepping. Once the computer has been told where to start copying, the prompt 'End here' will appear as the rest of the picture is drawn. Again, type 'Y' to mark the end of copying, otherwise press any key. If no end point is indicated, the computer will copy from the start point to the end of the picture. If no start point is given the computer will not copy the picture. The screen will then clear and re-draw the picture and the copied part. Because of the way the move commands are stored, and because of anomalies that could be introduced, if a picture is edited all the moves are also deleted, unless they occurred before editing started.



Double-height text is *Easyplot* option

D . . . Define colours This command is not easy to understand because of the complexity of the BBC and Electron's colour options and the wish to make them all available. The commands follow closely the actual colour commands in BBC Basic (COLOUR, GCOL and VDU19). *Easyplot* can therefore be used to demonstrate or gain more understanding of the relationships between logical and actual colours. I suggest you also refer to the User Guide sections on colour and mode.

The colours available depend on the mode chosen. The more colours required, the poorer the horizontal resolution (figure 1). It is left to you to decide on the best compromise. *Easyplot* does not support the eight flashing colours.

In mode 2 all the colours in figure 1 are available and the logical colours are the same as the actual colours. In modes 0 and 4 only two colours can be used. On selecting these modes the background colour (logical colour 0) will be black and the drawing colour (logical colour 1) will be white. In modes 1 or 5, the background colour (logical colour 0) will be black, the drawing colour (now logical colour 3) white, with two other colours available – logical colour 1 which is red and logical colour 2 which is yellow.

Any of these logical colours can be changed using the 'D' key. The computer asks which colour to change to. The reply will be a number from 0 to 7 from the list of actual colours given in figure 1 and printed on the *Easyplot*. The colours cannot be changed during another command.

A . . . Alter colour selects a new drawing colour. On pressing 'A' a series of numbers will appear, in different colours, to show the actual colours defined. In modes 0 and 4 the number 1 only will be printed, as these modes are two-colour modes. In modes 1 and 5 the numbers 1, 2 and 3 will appear in the colours defined. The new colour selected is shown by the border round the picture-drawing area – if it disappears then the colour chosen is the same as the background. After pressing 'A' the user is asked 'Which colour now?' and a number must be entered. This number can be either 0 or 1 in modes 0 and 4, from 0 to 3 in mode 1 or 5 or from 0 to 7 in mode 2. The number represents the logical colour and not the actual colour. The colour must be changed before using another command.

W . . . Clear the screen Pressing 'W' will clear the screen, reset the colours and erase the picture from memory. The computer will respond with 'OK to clear screen?'. If 'Y' is typed the picture and memory will be erased. Pressing any other key will result in the question 'OK to wipe memory?'. This is a special feature to enable overlays to be easily drawn and should only be used after a picture has been drawn and saved on tape or disc. If a map is required, after the outline has been drawn and infilled the map should be saved. Then if the memory only is wiped, the outline will still remain on the screen and more detail can be drawn. If the picture is again saved, only the detail drawn after wiping the memory will be saved. Then if the map is loaded using RPLOT, the overlay can be added later.

Several overlays can be drawn onto

the same outline without having to re-draw the map each time. A fail-safe feature of the wipe command is that the screen or memory will only be cleared if the 'Y' key is pressed. Any other key (apart from Break) will leave the wipe command without erasing the picture or memory.

S . . . Saves the picture Once 'S' has been pressed the user is asked for a title no more than seven letters long. Extra letters will be deleted from the end of the filename. With tape, the instruction 'Record then return' will appear. This enables the user to position the tape at the desired point. If a tape recorder with motor control is being used you will now be able to wind or rewind the tape. Press 'Play' and 'Record' together on the tape and then press Return. Now the computer will save the picture. A picture can be saved at any time and it is worthwhile saving parts of a picture as it is being developed.

E . . . Edit the picture This allows pictures to be edited step-by-step. The screen will clear and the first step drawn, then the prompt 'This step OK?' will appear. Type 'Y' or 'N'. The next step will then appear. Once the whole picture has been drawn step-by-step the screen will clear and the amended picture will be re-drawn.

I . . . Infill a shape with colour Move the cursor near the top of the shape to be filled in. The cursor must be inside the shape and the shape must be closed otherwise the colour will 'leak' out. Press 'I'. If using a four- or eight-colour mode you will now be shown a 2 by 2 pixel block, each element labelled A to D, and the currently selected colours will be shown, so a textured fill routine can be used. This greatly extends the range of colours, and works by the user defining a 'super pixel' – a block of four ordinary pixels. Any available colour, except the background colour, can be put in any of the four small pixels making up the super pixel. Selecting all four pixels will give a single colour infill. Experiment with this to produce a range of new colours and textures. The shape will now be filled using the current drawing colour or colours, and will work on irregular shapes too. Should the colour leak out, press Escape; then when the picture has re-drawn, close the hole and infill again.

The infill routine will only infill from the background colour – it will not work over a previously filled area. Care should be taken when editing, if the infill routine has been used, to ensure the infill boundaries remain intact to avoid leakage. Should this happen, wait until the infilling has finished, then enter the editor again, delete the infill, and re-insert it after closing the boundary. It is better not to do any infilling until the picture is complete.

Due to memory limitations, it's possible to draw a shape too complex for the infill routine. (Spirals are a good test!) Should this happen the routine will appear to stick and will not exit. Press Escape and when the picture has re-drawn, divide the shape into simpler parts and infill each.

X . . . Print picture out This has been included in 'skeleton' form to allow the picture to be dumped onto a printer. However, because of the variety of printers and the shortage of memory, no actual routine has been written into the program. It's easy to insert the specific call for one of the print dump ROMs, or to call up a machine code dump stored on disc or cassette. Otherwise see one of George Hill's dump routines published in *Acorn User*. Any dump routine written into the program will reduce the available memory. I've included Basic routines for Acorn/Seikosha and Epson printers.

A print-dump routine can be added at the end of PLOT2 in the procedure skeleton. You will then need to re-save PLOT2 with the routine included.

@ . . . Prints memory left This checks on how much memory is left to store the picture. The number printed when the '@' key is pressed is the number of memory locations remaining. The following commands use no memory: D (define colour); A (alter colour); X (print picture); S (saves screen). These commands are stored in eight memory locations: R (draw rectangle); L (draw line); C (draw circle); I (in-fill); M (move and re-draw).

The edit command will release memory for use. The wipe command will reset memory. The follow mode fills three locations each time the cursor moves so is very expensive on memory. If all memory has been used up a message will appear and the user will only be able to select the edit facility, colour change or define commands, the screen dump or the wipe and save commands. If such a situation arises and the picture is incomplete, use the overlay feature to finish the picture. This gives limitless memory.

Z . . . Load picture This allows a picture to be loaded in from tape or disc. A picture can be started and saved, and later entered again to be finished. A picture can be loaded in at any time to add to an existing picture provided there is memory left. This enables libraries of small picture routines to be built up and put together.

The **Escape** key gets you out of any routine started. To avoid leaving incomplete parts of a routine on the screen, the screen is first cleared after pressing Escape and the picture re-drawn up to the last complete command. Escape is most useful for getting out of the infill routine if the colour has leaked.

Memory storage

The program will reserve as much memory as possible for the picture store. The amount reserved will depend on the mode, whether disc or Econet is fitted, and the length of any printer routine. Most commands are stored in just eight bytes of memory – so over 100 can be stored in 1k. By using these memory packing techniques it's possible to load and save pictures much quicker than by saving the whole screen picture. It also makes the Edit and Move and Redraw commands possible. The only disadvantage is that should these pictures need to be incorporated into the user's own programs then the drawing routines will need to be included too. For this reason the program RUNPLOT is included – see next month for details of how to use it. However, there is still a considerable time bonus over the full screen saving routine which saves each pixel on the screen and it gives the user greater flexibility.

To allow use of all graphics modes, *Easyplot* has been kept as short as possible. Problems may be experienced by users with disc machines – the disc filing system uses extra memory, leaving less for the user. To get round this, several special features have been built into the software, and these will be discussed next month.

Figure 1. Screen resolution and colours on BBC micro and Electron

Screen mode	Colours available	Horizontal resolution	Vertical resolution	Memory used
0	2	640	256	20k
1	4	320	256	20k
2	8	160	256	20k
4	2	320	256	10k
5	4	160	256	10k

The actual colours are numbered as follows:

COLOUR 0 . . . Black
COLOUR 1 . . . Red
COLOUR 2 . . . Green
COLOUR 3 . . . Yellow
COLOUR 4 . . . Blue
COLOUR 5 . . . Magenta (blue/red)
COLOUR 6 . . . Cyan (blue/green)
COLOUR 7 . . . White

Martin Phillips' *Easyplot* listings can be found on yellow pages 105-108.

HELP IS AT HAND

Richard Harris with more hints for handling ROMs

ROUNDING off the series, in this third article on sideways RAM, *HELP is expanded to recognise two keywords (COM and ROM); a facility to turn ROMs off is added; and I'll be telling you how to add your own routines.

*HELP expansions

*HELP COM simply gives a list of all the ROM's commands. *HELP ROM gives a table listing all the ROMs in the machine. In addition it states if the ROM is a language (by looking for a language entry – see first article), whether it will initialise on a hard reset or only a soft reset, and whether it is currently switched on. Also the state of the 'break intercept' is shown. These last points will now be explained.

First, language ROMs. Normally on a hard reset (CTRL-Break) or on turning on, the computer will enter the language ROM in the highest numbered ROM socket (if no ROM expansion board is fitted, this is the right-hand socket). Usually this is Basic in socket 15, but is not essential: any language can be the main one – if you mainly do wordprocessing, you might want your wordprocessor as the main language. Other languages have to be entered by trapping a start-up call, eg, *WORDWISE. Having said this, there are a few language ROMs which will not start up with a hard reset – this depends on the ROM type byte as described in the June issue of *Acorn User*. These languages can only be entered by a *name call, whatever their ROM number.

Controlling paged ROMs

How does the Operating System know which ROM sockets have a ROM in them? When Break is pressed, it checks each socket for a ROM by looking for a copyright string. If one is present a record of the ROM type byte is kept in a table; if not, a zero is stored in the table. In future sideways ROM handling, any sockets with a zero in this table are ignored. *FX 170 can be used to find where this table is kept (16 bytes from &2A1 in OS 1.2). In addition, a record is kept of where the Basic ROM is – *FX 187 can be used to read or write this value. *BASIC is not passed to the ROMs to see if it is recognised; instead the OS selects the ROM given by *FX 187 (assuming the computer has a Basic ROM fitted).

The software provided keeps a copy of this table in sideways RAM. Now any ROM can be turned off by putting a zero in the OS table at the correct point. *ROFF n is used to do this, where n is a hexadecimal number from &0 to &F. To turn the ROM on, use *RON n; this restores the OS table from the RAM copy, and provides a simple way to avoid command name clashes, or ROMs that are incompatible because they use the same memory locations as flags.

The 'break intercept' is enabled with *BON. After this, any ROMs turned off before pressing the Break key will still be turned off after the reset. *BOFF turns this feature off. After a hard reset (CTRL-Break) all the ROMs will be turned on.

Adding commands

It's fairly easy to add commands to the listing. However, as much of the sideways RAM is used by the buffers, there is not that much space left. The principles outlined will be of more use when writing your own completely new ROM software.

First, the actual routine must be written; this can be added to the listing at any convenient point, eg, just before all the data tables. Ask yourself if any temporary stores are needed, can some already defined be used (eg, temp, templ, etc) or do you need some new ones? If you need some RAM outside the sideways RAM do you want to save this? The routines 'push', 'pull' and 'shift' show how this can be done. Remember to restore the original memory after your routine!

Software for sideways ROMs cannot use itself as temporary stores. It's possible to use various areas of memory such as the RS423 buffers, but this is not always convenient. The OS allows for this by letting sideways ROM raise the value of PAGE in 256 byte blocks from the normal value of &E00. A good example of this is the standard DFS. There are two ROM service calls involved:

1. Absolute workspace claim. This block of memory can be used by any ROM, though only one at a time. On entry the Y register contains the most significant byte of the current value of PAGE, initially &E00. If the value is inadequate for your purposes a new value should be placed in the Y register. The DFS returns a value of &1700 (ie, &17 in Y). If you wish to use the absolute workspace, service call &A should be issued, using *FX143,10 to warn the current user. Conversely, if service call 10 is received and you are using the absolute workspace, you should save any vital information in your private workspace.

2. Private workspace claim. A block of memory which only your ROM can use. Vital data can be stored here, including whether you are the current user of the absolute workspace. On entry the Y register contains the address of the next available page. If only the DFS is responding to these service calls, Y will be &17 at first. As with all service calls the X register contains the current ROM number. If private workspace is needed, the Y register should be increased by the number of 256-byte blocks required. The DFS adds two to Y, which usually sets PAGE to &1900.

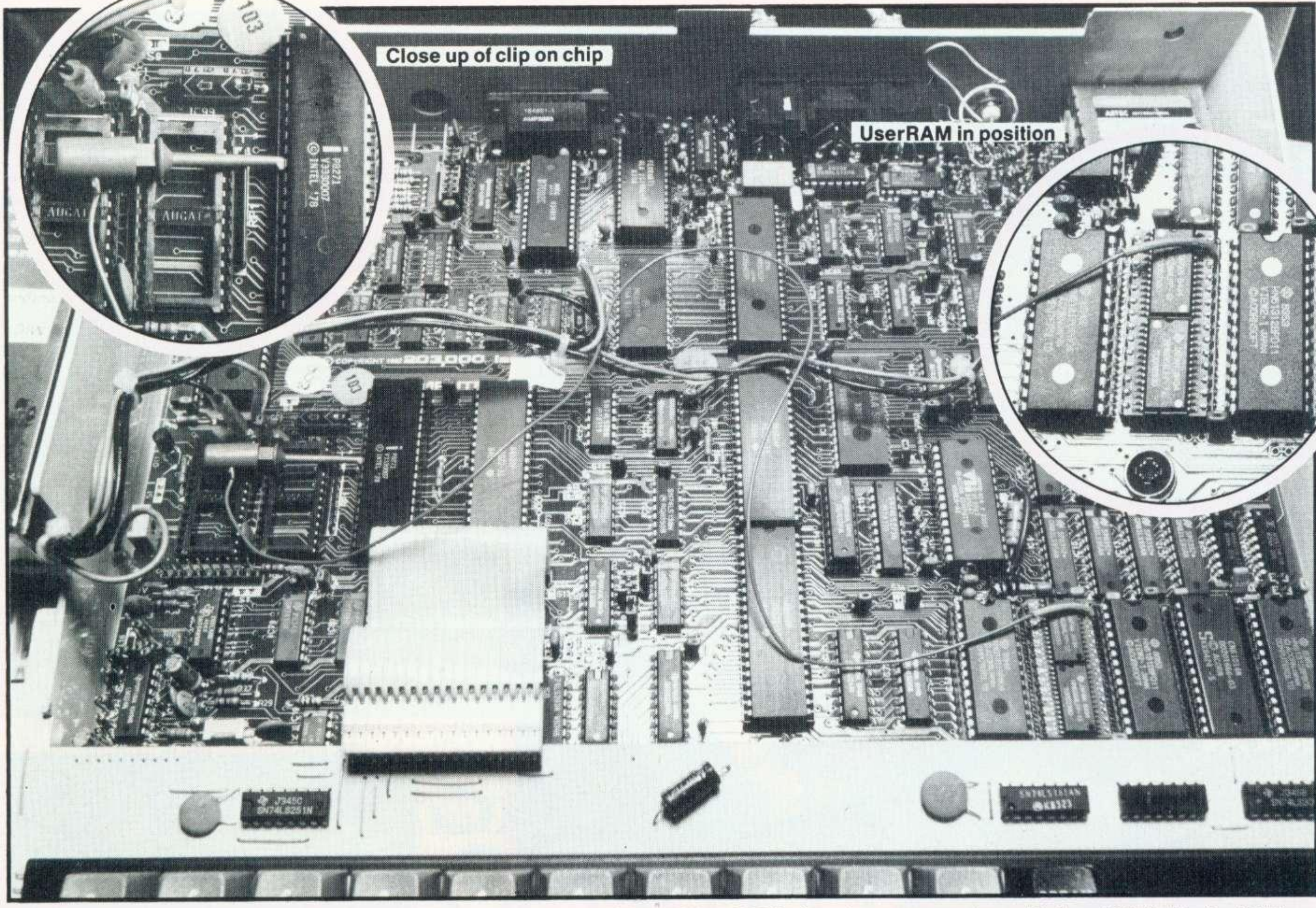
However, the DFS cannot assume its private space is &1700 to &18FF as other ROMs may also be using these calls to claim memory. A table of where each ROM's workspace is exists at &DF0 to &DFF; the start address should be saved by STY &DF0,X at the start of the service call.

A means of calling the routine must now be added. Most of the software is already present. The routine name must be added to the list in 'data2'. This should be followed by a zero byte if it is succeeded by parameters (eg, *VERIFY 0), or a byte of &D if there are none (eg, *BUFFON).

Lastly, the new name should be checked for in the 'command' routine. This is perhaps not the most compact coding but is fairly clear as to what is happening. Reset Y to point to the start of the unknown command (LDY temp), then point to the command name in 'data2' (LDX #108 will point to the first new command added) and then call the 'name recognition' routine (JSR recog).

On return from this use BNE to branch if the name was not recognised, or else JMP to the actual routine. At the end of the routine use 'JMP stop' to exit cleanly from the sideways ROM.

For listing, and notes on how to enter the program, see yellow pages 109-110.



UserRAM in place in BBC micro sideways RAM socket between OS and *View* ROMs. Lead goes across board to leg of 8271 chip (or IC77)

FIRST EASY-FIT SIDEWAYS RAM

● 16k ● Fully-compatible with BBC B/B+ ● Backed by *Acorn User* ● 3 minutes to fit ● Software support ● Comprehensive manual ● Disc or cassette ● Simple for schools ● Ideal for Econet ● No soldering ● No chips to remove ● No cutting tracks ● Only one lead to fit

TAKE a piece of software, load it in UserRAM using the utilities provided and it can be accessed instantly using a '*' command or run as a Basic program: no waiting for the disc or cassette. It's just like using software on a chip such as *Wordwise* or *View*.

The *Acorn User* UserRAM is as easy to install as a sideways ROM, with just one lead to clip onto the leg of a chip (there's a choice of two) – there's no need to unplug the chip to fit the lead. It takes three minutes to do – and two of those are taken up removing and replacing the BBC's lid! This has been made possible by fitting two of the latest 8k RAM chips onto a circuit the size of a standard 16k EPROM or ROM.

A comprehensive printed manual gives fitting instructions, information on how to create your own sideways RAM software, ideas on using the equipment and technical notes on how the utilities provided work. Also, a standard disc (which runs on 40 and 80 track drives with any DFS and is unprotected) is supplied with all the basic utilities needed. One year's guarantee is given, with postage and VAT included.

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SO EASY TO FIT

1. Switch off BBC micro. Remove lid and keyboard to reveal sideways ROM sockets.
2. Insert UserRAM into any empty sideways ROM socket, just like a normal chip.
3. Take lead over to left of BBC board and clip to leg of a chip (does not have to be soldered, or chip removed).
4. Replace keyboard and lid.
5. That's it! You're ready to check the installation with the software supplied.

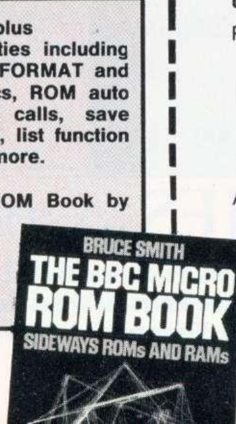
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No party connected with this product will give aid to anyone seeking to break software copyright. *Acorn User* welcomes details from software houses willing to license schools and other users of UserRAM for their products.

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- **19 new utilities including printer buffer, *FORMAT and VERIFY for discs, ROM auto boot, two OS calls, save graphics screen, list function keys, and much more.**
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Fill in this coupon and send it (or a copy) with your remittance to UserRAM, *Acorn User*, 68 Long Acre, London WC2E 9JH.

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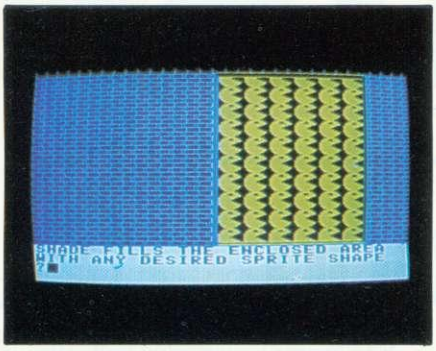
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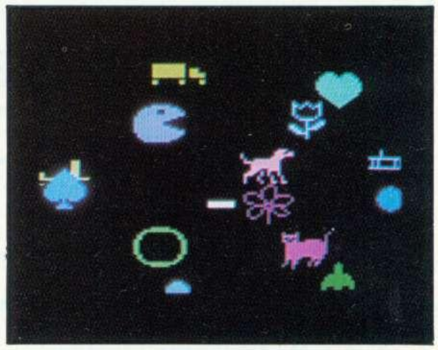
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+ Logo ROM
+ extension disc
ALL FOR £198.95 inc. VAT



THE Logotron Sprite Board is a new piece of hardware – the first of its kind in Britain – which brings a new dimension to graphics programming on the BBC B. Controlled through Logo, it enables you to create up to 32 different sprite shapes, in 16 colours, place them anywhere on the screen, and move them independently.

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And there are four more chances to bring free sprites into your life at the Acorn User Show (Barbican Centre, London, July 25-28). You can order your Sprite Board by bringing along your order form and dropping it into the box on the Logotron stand (stand 71). At the end of each day, a prize draw will select one form – winning the lucky reader a free Sprite Board package!

Offer closes Monday September 30; valid in UK only.

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SEND TO LOGOTRON SPRITE BOARD OFFER, ACORN USER, 68 LONG ACRE, LONDON WC2E 9JH.



Simon Dally reveals a billionaire hacker's secrets – and gives you a chance to win a Cumana disc drive or other goodies

PRIME PRIZES

APRIL RESULTS

April's competition about the Saqqara Stone was quite genuine (contrary to what a few of you thought) and was difficult. Only 386 people entered, and around 25 per cent were correct. The two possible solutions were as follows:

7	7
343	343
27601	27608
9982805	9982105
14 56	14 56

Both yield a sum of 10,019,520. The 50 winners have been notified by post.

The following is an extract from *The Happy Hacker: Conversations with Cyrus M. Fingerspitzengefuhl,* Venusian Historical Press:

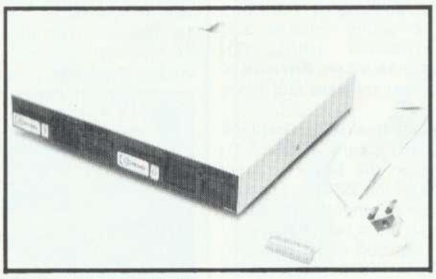
'Of course, the youth of today have no finesse,' Mr Fingerspitzengefuhl confided to me as he passed the port across the artificial gravity shield and beckoned to a passing android for a cigar ('strictly against Galactic Medical HQ's laws but who cares, dear boy? I wiped my file clean there years ago . . .').

He lit it with exaggerated ostentation from a jet of flame which emerged from a port on his keyboard at the touch of a function button, before returning to his theme.

'OK, the rules may be tougher now – I gather they chop off your hands if you're caught hacking these days – but the practitioners lack discipline. They have no purpose. All this business of trying to get into banks. It's so retrograde – why, I did that way back in 1985.' A misty glaze came over the old buffer's eyes and I caught my breath. Was I about to hear from the horse's mouth how the wealthiest man in the universe had made his first billion before the age of 15?

'It was simple really,' the old man continued, lost in his reverie. 'Once I discovered that the programmer's academic career had been spent researching prime numbers I knew which line of attack to take. There were three numbers you had to type to gain access to the system. In fact I'll give you a thousand gold credits if you can retrace what I did. . . .'

'Please continue, Sir,' I whispered.



Dual drive by Cumana

'Well, first you had to type in the highest existing "superprime". As you know, a superprime is a prime number where if you strip off the digits from right to left you're still left with prime numbers. 7393 is a superprime because it's prime, along with 739, 73 and 7. But there are others, higher.

'The next number was a cyclic prime – so called because all the numbers created by cycling its digits are also prime. To give you an example, 99371 is a superprime because it's prime along with 93719, 37199, 71993 and 19937. In the case of the bank it was the highest cyclic prime containing less than nine digits.

'The final number was based on the idea that every positive integer can be expressed as the sum of a prime number and a power. Thus $609 = 8^3 + 97$ and $162 = 7^2 + 113$. There is one exception to this rule in numbers below 10,000 – that was the answer!

'The boring bit was that after typing in that lot there was still a password to guess. My intelligence sources told me the programmer invariably used common English words containing nine letters, but it wasn't until I worked out that it was an anagram of CARTHORSE that I finally cracked it!'

He chuckled and refilled his port glass. 'All that you see here,' he continued, waving his hand airily at his fabulously rare and expensive collection of antiques – back numbers of *Acorn User*, a working QL computer, a genuine Alex van Someren Econet – 'stems from my success with that bank.'

The old man seemed tired after this confession: possibly the port was making him light-headed. I made my excuses about having to teleport home before the late-night rush hour. He escorted me to my tardis. 'If you solve how I did it,' he said as I opened the door, 'from which bank would you like to receive your reward?'. There was a twinkle in the great man's eye.

I shook hands with him and prepared to leave. 'Come again, dear boy,' he said warmly. 'I must tell you some time how I started the Third World War.' . . .

What were the three numbers and password Cyrus typed to break into the bank? Answers on a postcard please to arrive not later than September 6, 1985. Address them to August Competition, *Acorn User*, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

The sender of the first all-correct solution to be opened after September 6 will receive a Cumana 40/80 track switchable dual disc drive and interface for the BBC micro or Electron (Electron needs Plus 1 fitted). Second prize: a Cumana touch pad. Three runners-up prizes: boxes of Cumana discs ($3\frac{1}{2}$ in or $5\frac{1}{4}$ in).

BACK ISSUES!

1. July/August 1982 The first issue. Articles on drawing techniques. The BBC Computer Programme. Machine code graphics. Questions & answers. Hints and Tips. Sound. Interfacing scientific instruments. Dumb Terminals for 0.1 machines. Disc drives. Econet in schools.

2. September Ceefax telesoftware. Beeb in business. Mailing list. Simple files. 30-Hour Basic course. Art on a micro. Music. BBC micro as a key-



board. Extra Atom commands. BBC Basic board. ULA design. Teletext graphics. Machine code graphics. Analogue input. Schools training. 0.1 cassette bug patch.

3. October Electron details. BBC TV series – confessions. Two Epson graphics dumps. Seikosha GP100 dump. Worldwide networking for BBC micro. Garbage handling. Voice ROMs. Sound pitch envelope. Moving graphics. ZX printer for Atom. RGB colour separations for Atom. Biofeedback. Book reviews.

4. November Teletext. Second BBC TV series. Machine code series 1. Programming forum. *Trek III*. Speeding up graphics. Bomber game listing. 7-tone Epson graphics dump. Atom graphics manipulation. Dumb terminal for 0.1 machine. Firework graphics. Editing tips.

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5. December BBC TV in schools. Machine code 2 – registers. Programming forum. Program generators. Carols. Hints & Tips. Logo and Turtle graphics in schools. Introduction to procedures. Software review. Atom word processing. Toolbox review. 16-colour graphics on model A. Sorting. Sound envelope design.

6. January 1983 MEP school launch. *FX commands for sound. Second BBC TV series. Machine code 3 – two pass assembly. Disc drives for the Beeb. Programming forum. Program protection. Micros in schools – new series. Commodore Pet printer used with Beeb. BBC programs written on an Atom. Extra Atom memory.

7. February 1 MHz bus examined (4). 3D Atom graphics (3). Atom BBC Board reviewed (3). Machine code 4 – memory (5). BBC Computer Literacy update (1). Atom error handling (2). Micros in schools 2 – getting organised (6). Hints and Tips (4). Beeb Forum (3). Reviews of *Wordwise* (2) and the Amber printer (1).

8. March Chess on the BBC micro (3). Sound on the Beeb (4). Printers for beginners (4). Atom analogue converter (2). Schools 3 – micros and maths (6). Machine code 5 – indirect addressing (3). DIY lightpen (5). MEP's *Microprimer* review (2). Atom Ross toolkit review (1). Beeb Forum (2). Assembly language and Pascal book reviews (2).

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9. April *Hexangle* game listing (4). Bach on the Beeb (4). Hints & Tips on disc drives (4). Machine code 6 – the CALL statement (4). Interfacing the 1 MHz bus (3). Schools 4 – young children and micros (6). Graphics listings (2). Printers for beginners 2 (4). Reviews of BCPL, educational software and Atom software (3).

10. May Review of Basic II(1). Graphics listings(1). New *FX calls in OS1.2(1). Colour mixing on the Beeb(4). Jazz, blues and folk on the BBC(6). Schools 5 – language development(6). DIY Beeb interface box(4). Atom sound board(5). A to Z of printing: how to get going(4). Hints and Tips: PROCs, discs and FNs(5). Printer, software and book reviews.

11. June Techniques series – sorting(2). Hints and Tips: 50p network(5). Drawing techniques and CAD(5). Machine code: interrupts(6). Schools 6 – information technology. Atom Forum. Beeb Forum. Printers – write your own graphics dumps(4). Comparative review of *View* and *Wordwise*(3). Three graphics packages reviewed(3). Test of *Acorn User's* interface box(4).

12. July Techniques – hash tables(2). Hints and Tips: logic made easy(5). Recursion and graphics(6). Handling strings(3). Two ideas for passing variables(2). Beeb aids the blind(2). DIY second keyboard(5). Beeb Forum. Sounds on the Atom(2). Hardware, firmware, software and book reviews. Atom Forum.

13. August Printer graphics and dumps(2). Techniques – Tree structures and sorting(2). All the fun of the fair(7). 40/80 disc copier(2). Colour painting(5). Basic II: random access files(2). Screen dumps for Olivetti, Centronics and Seikosha(5). Atom strings(3). Reviews of Tandy CGP115 printer, five educational packs, A to D converter.

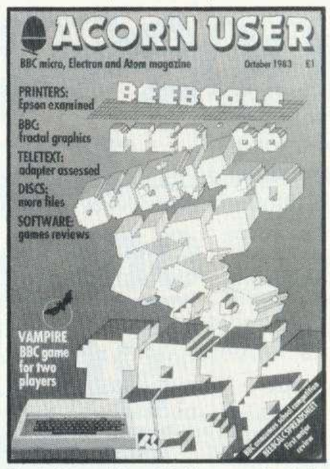
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14. September Techniques – ink-blots and mazes. Painting by lightpen. DFS space explored. Beeb Forum. *Mega*



Monsters game listing. Machine code graphics dumps. Atom Forum. Atom cassette recorder check. Reviews of Atom RAM boards, Cumana disc manual, *Logo* for schools, Hobbit floppy tape and books.

15. October Women and computing. Techniques – random numbers. Review of Computer Concepts' *Beebcalc*.



Fractal graphics. 57 files on 40 & 80 track discs. *Vampire* game listing. Beeb Forum. Assembly code controls tab key. Osfile merging. Atom future. Atom verify routine. Reviews of *Vu-Type*, Procyon Atom book, Epson FX80, Teletext adapter, disc drive, software.

16. November Techniques – impossible problems. Contour graphics. Connecting two Beebs together. XREF: sorts & lists variable, function and procedure names. Assembler utilities in Basic II. OS, VDU, *FX, OSBYTE calls – **pull-out poster**. Disc overlays. Adding extra Atom commands. Reviews of 7 educational packs, Atom ROM, books, games.

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17. December Random graphics. Animated graphics in colour. Techniques – graphs. Hints & Tips. Universal printer dump. 6522 connected to the Electron. Saving machine code. Beeb Forum. Graphics **pull-out poster**. **Index:** July 82–July 83. Forum Extra: EQUS. BBC helps the disabled. Schools – data processing. Transferring data between Beebs, Atoms . . . or Pets. Atom block demolition utility. Atom disassembler program. Reviews of software, books, educational programs from Chalksoft.

18. January 1984: Games special issue Techniques – graphs part 2. Stacks and queues, Basic and languages. Hints & Tips. Voice chip revealed. How to write games. Electron interfacing. Beeb Forum. Life graphics routines. *Defencecom* game listing. *The Train Game* listing. Machine code graphics. Where to put machine code. Schools – handling data. Juki daisywheel printer examined. Atom Forum and adventure.



Reviews of utilities, software, *Beeline* wordprocessor, educational packages, two chess programs.

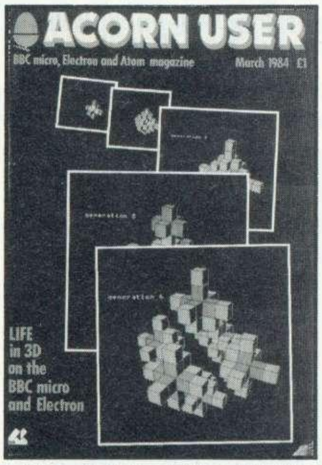
19. February: Adventures special issue Techniques – efficient sorts(3). PROC for a numeric keypad on the Beeb keyboard(1). 12 graphics listings(1). Random access filing on disc(5). Locking files(2). MCP40 printer/plotter looked at(5). Hints & Tips(3). Beeb Forum(2). Make discs readable on 40 and 80 track drives(4). Screen memory



organisation(3). Hints on adventure design(3). Adventure action(4). Adventure ideas in computer language(2). Text compression(2). Word-crunch-

ing(4). VIA chip on Electron to drive a parallel printer(3). Atom Forum(2). Schools – simulation packages(4). Reviews: *Disc Doctor*, Leasalink's DFS upgrade, Hitachi's microdrive system, Solidisk's sideway RAM board, software.

20. March Utility: timing routine. Fractals. Teletext and mode 7 dump. ROMs reviewed. Hints & Tips. Beeb Forum. Add sounds to your games. Learn Lisp

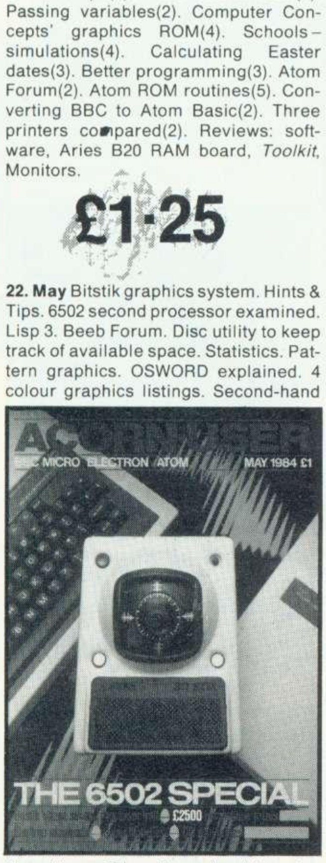


1. Cube graphics. Printer driver for View. Basic II from Basic I. Beeb's ADC chip. Atom Forum. Listing formatter for the Atom. Atom 'bytes free' routine. Schools – test of *Factfile*. Keyboard skills. Amcom DFS v Acorn DFS. Reviews: *Beebpen* wordprocessor, Atom expansion system, software, books.

21. April Beeb graphics on TV(3). 6845 chip explored(3). Advanced filing systems(1). Lisp 2(4). Hints & Tips(3). Beeb Forum(4). Choose disc tracks to copy(4). Function key editing(4). Teletext dumps(3). CES scrutinised(3). Passing variables(2). Computer Concepts' graphics ROM(4). Schools – simulations(4). Calculating Easter dates(3). Better programming(3). Atom Forum(2). Atom ROM routines(5). Converting BBC to Atom Basic(2). Three printers compared(2). Reviews: software, Aries B20 RAM board, *Toolkit*, Monitors.

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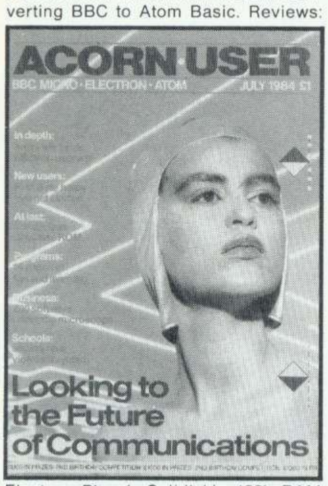
22. May Bitstik graphics system. Hints & Tips. 6502 second processor examined. Lisp 3. Beeb Forum. Disc utility to keep track of available space. Statistics. Pattern graphics. OSWORD explained. 4 colour graphics listings. Second-hand



disc drives. Education – do girls get a fair deal? Atom Forum. BBC to Atom Basic 2. Reviews: British Micro's Grafpad, *Edword* wordprocessor, 4 sprite generators, Opus microdrive, Beasty, software.

23. June Acorn Z80 second processor(3). Forth(2). Graphics to brighten up your games(2). Soft Pottery graphics(4). Go faster and save memory space(3). Rapid search and load routine for tapes(2). How the Beeb and Electron work 1(3). Business: reviews and how to gently enter office computerisation(4). Education – adult literacy(3). Dumping Atom programs on the BBC(2). Atom Forum. Software copyright laws(2). Hints & Tips(4). Techniques – B-Trees(3). Beeb Forum(2). Reviews of monitors, printers, books, software, adventures, EPROM programmer.

24. July Communications: the future; portable micros; modems & electronic mail. Hints & Tips. First Byte: using your micro. Beeb Forum on Basic. How it works II: slow down the Beeb. Business: Acorn's Z80 software, Starbase ROM. Education: a look at Edfax, how to teach facts. Atom Forum. Converting BBC to Atom Basic. Reviews:



Electron Plus-1, Solidisk's 128k RAM board, three IEEE interfaces, Canon colour and Brother printers, ADE ROM.

25. August Downloading the weather. Teaching tots: keyboard overlays, activity board. First Byte: writing & debugging programs. Hints & Tips. Beeb Forum: 6502 second processor & Tube tips. How it works III: random numbers. Business: Plan software for Z80. Atom Forum, avoiding errors. Reviews: 3 drawing packs, Torch Unicomm, MCP's Interbeeb, software plus for Micronet.

26. September Decoding radio signals, First Byte: getting moving. Hints & Tips.



Education: problem solving. Sprite design and animation part I. Beeb Forum: fastest dump. Write your own disc formatter. How it works IV: random number generator. Business: Nucleus software for Z80, accounts. Atom Forum, ? and !. Reviews: Torch Unicorn, Quinkey, Parfitt plotter, Turbo compiler, Multi-aid.

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27. October The BBC and space. First Byte: noises on the Elk. Hints & Tips. Sprite design and animation part II. Programming the 8271. Sorting techniques. Diagnosing ills in the Beeb. Beeb Forum: NFS update. Education: report on government scheme, review of Microtext. Atom: wordprocessor. Communications: bulletin boards. Reviews: Basic utility ROMs, sideways ROM sockets, Bearsoft's Editor, Watford's Buffer & Backup, Ampersand's Colour module.

28. November Acorn's ABC range. First Byte: drawing. Hints & Tips: 3D-effect printing. Sprite design and animation part III. Floating point variables. ROM juggler. *Micro Live*. Education: news, Edword in the classroom, school quiz. Atom forum: hardware, the Auto command. Reviews: Six turtles and buggies. Toad's extension socket, Watford's Speech Synthesiser and



Beebfont ROM, BBtype, Romex 13 ROM board, 3 language coaching packs, two graphics tablets.

29. December Guide to bar codes. First Byte: text & graphics windows. Hints & Tips: control codes for Epsons. The Domesday project. Low-cost keyboard for the Beeb. Dumping games' screens. Speed up your micro. DIY database. Education: news, science quiz, review



of the Dudley suite of software. Atom: Forum, build a ROM pager, competition. Reviews: 6 databases compared, part I of lightpens, Acornsoft's Logo and Pascal, best games of 1984.

30. January 1985 Games special: Quadline, Picture Puzzle, musical tunes. Colourfill graphics. Hints & Tips. Operation



Raleigh report. Setting up your own teletext database. Second processors examined. Education: news, activity board revisited. Reviews: 6 wordprocessors compared, three astronomy packs, software for lightpens.

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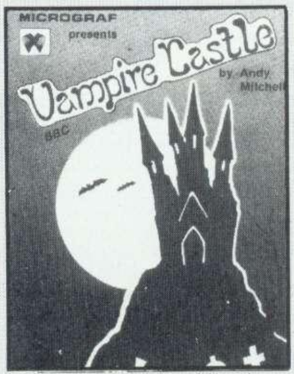
Eleven issues are not available – July 1982; February, March, April, May, June, July and August 1983; February, April and June 1984. Photocopies of articles are available at 18p a page (minimum charge 50p, inclusive of postage). Orders should be addressed to AU Photocopies, Redwood Publishing, 68 Long Acre, London WC2E 9JH. Figure in brackets indicates the number of pages in each article.

HOW TO ORDER

Fill in the order form on page 96 and send with your cheque or postal order for £1.25 per issue (made payable to Redwood Publishing) to Acorn User Services, PHS Mailing Ltd, PO Box 14, Horley, Surrey RH6 8DW.

TWELVE TEMPTING TITLES

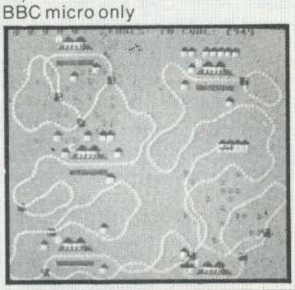
Acorn User presents 12 titles to captivate, entertain and educate. Could you run a railroad? . . . find out with *Trains*. Try your hand at swordfencing with *Swordmaster*. Break into the computer with *Hacker 2000*. Beat the bacteria in *Corpuscle*. Face the final frontier in *Trek*. Try three great games with our compendium. Or see how good your adventuring skills are with *Vampire Castle* and *Flint's Gold*. What more could you ask for? All these tried, tested and developed by Micrograf.

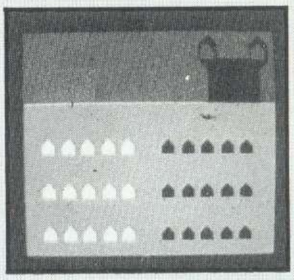


Make sure you play this adventure with the lights on. You can almost smell the dank odours and feel the terror around every corner.
£6.95 Cassette, £9.95 Disc (40/80) BBC micro only

TRAINS

This classic game by Peter Balch requires quick wits and clear thinking. Your aim is to manoeuvre a number of trains around a complex network of track, as you pick up fare-paying passengers and deliver them to their destinations.
£7.95 Cassette, £10.95 Disc (40/80)
BBC micro only



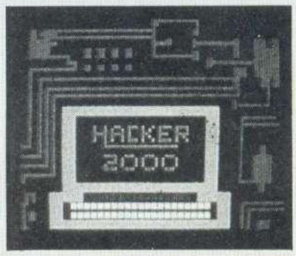


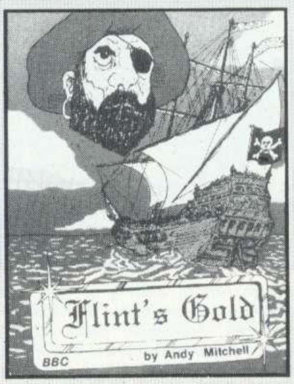
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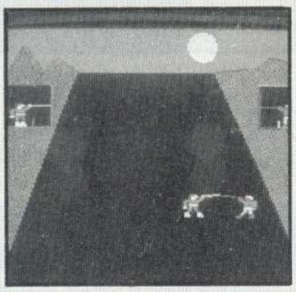


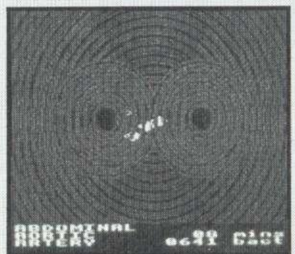


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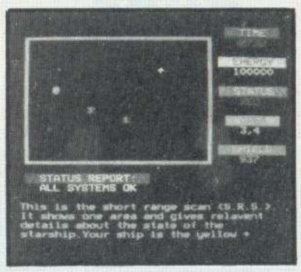
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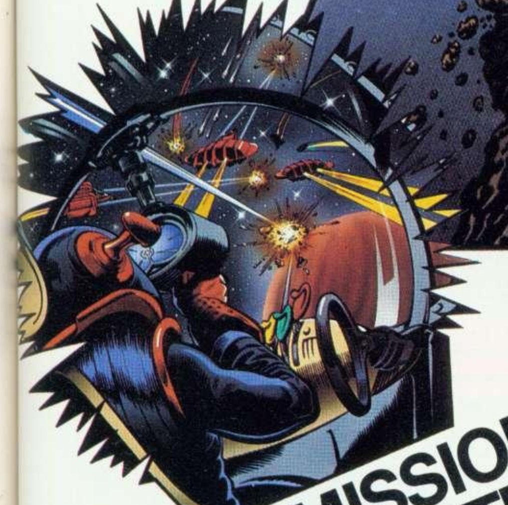
CRAZEE CAVERNS: Pete the Potholer is on an epic journey through a fantastic underworld ruled by Willy the Wierd. Pete must take control of each of the caverns making up this empire step-by-step. To help in this task, a local wizard has coated his feet with a magic dye, so Pete can see how much ground he has covered.



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TELLSCOPE is an early learning package for 2 to 10 year-olds which provides a kaleidoscope of words, pictures and music. It is designed with options to test word/picture recognition and association, as well as memory and speed, and includes upper or lower case text. These options make it suitable for a wide range of ages, and for use with or without adult supervision.

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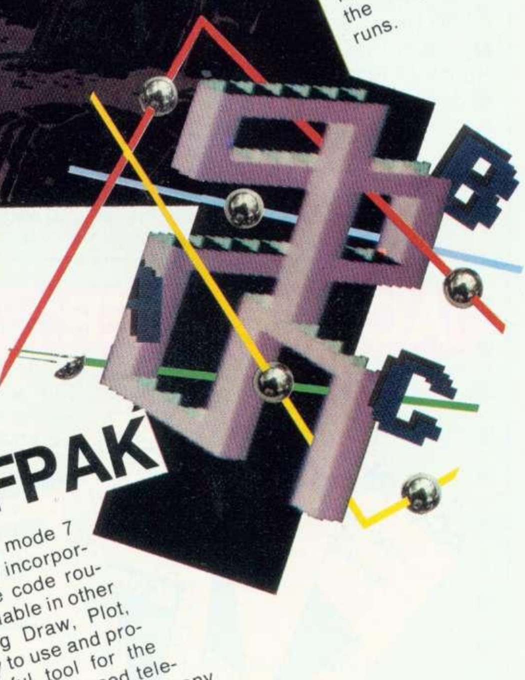


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See 'Hints & Tips', page 40

INDEX

[1] *With modified address* [2] *With sideways RAM fitted*

Listing 1. Using assembly language to sound a bleep

```
  1 REM Listing 1
 10 REM Bleep using assembly language
 20 REM by Martin Phillips
 30 REM For BBC and Electron
 40 REM (c) Acorn User
 50 :
 60 PROCinitialise
 70 PROCassemble
 80 CALL &C00
 90 END
100 :
110 DEFPROCinitialise
120 oswrch=&FFEE
130 ENDPROC
140 :
150 DEFPROCassemble
160 P%=&C00
170 [
180 LDA #7      \ Load Acc. with 7
190 JSR oswrch \ Do OSWRCH with A=7
200 RTS
210 ]
220 ENDPROC
```

Listing 2. Sounds a bleep with a keypress

```
  1 REM Listing 2
 10 REM Bleep when key is pressed
 20 REM by Martin Phillips
 30 REM For BBC and Electron
 40 REM (c) Acorn User
 50 :
 60 PROCinitialise
 70 PROCassemble
 80 CALL &C00
 90 END
100 :
110 DEFPROCinitialise
120 oswrch=&FFEE
130 *FX14,2
140 *FX213,200
150 *FX214,1
160 code%=&C00
170 ?&220=code% AND 255
180 ?&221=code% DIV 255
190 ENDPROC
200 :
```

Continued ▶

```
210 DEFPROCassemble
220 FOR pass=0 TO 3 STEP 3
230 P%=code%
240 [
250 OPT pass
260 STA &FC        \Store event number
270 PHP            \Save registers
280 PHA
290 TXA
300 PHA
310 TYA
320 PHA
330 :
340 LDA &FC        \Load event value
350 CMP #2
360 BNE end        \If not 2 go to end
370 :
380 LDA #7         \Load accumulator
390 JSR oswrch     \Execute OSWRCH A=7
400 :
410 .end           \Restore registers
420 PLA
430 TAY
440 PLA
450 TAX
460 PLA
470 PLP
480 RTS             \Return
490 ]
500 NEXT pass
```

Listing 3. Changes text colours in mode 1

```
  1 REM Listing 3
 10 REM Change text colours
 20 REM by Martin Phillips
 30 REM For BBC and Electron
 40 REM (c) Acorn User
 50 :
 60 MODE 1
 70 PROCinitialise
 80 PROCassemble
 90 *FX14,2
100 END
110 :
120 DEFPROCinitialise
130 oswrch=&FFEE
140 VDU19,0,4,0,0,0
150 code%=&C00
160 ?&220=code% AND 255
170 ?&221=code% DIV 255
180 ?&70=1
190 ENDPROC
200 :
210 DEFPROCassemble
220 FOR pass=0 TO 3 STEP 3
230 P%=code%
240 [
250 OPT pass
260 STA &FC        \Store event number
270 PHP            \Save registers
280 PHA
290 TXA
300 PHA
310 TYA
320 PHA
330 :
340 LDA &FC        \Load event value
350 CMP #2
360 BNE end        \If not 2 go to end
370 :
380 LDA #17        \Change text colour
390 JSR oswrch     \to value stored in
400 LDA &70        \location &70
410 JSR oswrch
420 :
430 ADC #1         \Increase text colour
```

Continued ▶

```
440 STA &70         \by one, and if
450 SEC             \greater than 4
460 SBC #4          \put the value of 1
470 BCC end         \back in location
480 LDA #1          \&70
490 STA &70
500 :
510 .end            \Restore registers
520 PLA
530 TAY
540 PLA
550 TAX
560 PLA
570 PLP
580 RTS             \Return
590 ]
600 NEXT pass
610 ENDPROC
```

Listing 4. Prints numbers in a different colour to letters

```
  1 REM Listing 4
 10 REM Change colour for numbers
 20 REM by Martin Phillips
 30 REM For BBC and Electron
 40 REM (c) Acorn User
 50 :
 60 MODE 1
 70 PROCinitialise
 80 PROCassemble
 90 *FX14,2
100 END
110 :
120 DEFPROCinitialise
130 oswrch=&FFEE
140 VDU19,0,4,0,0,0
150 code%=&C00
160 ?&220=code% AND 255
170 ?&221=code% DIV 255
180 ?&70=1
190 ENDPROC
200 :
210 DEFPROCassemble
220 FOR pass=0 TO 3 STEP 3
230 P%=code%
240 [
250 OPT pass
260 STA &FC         \Store event number
270 PHP             \Save registers
280 PHA
290 TXA
300 PHA
310 TYA
320 PHA
330 :
340 LDA &FC         \Load event value
350 CMP #2
360 BNE end         \If not 2 go to end
370 :
380 LDA #17         \Change colour to
390 JSR oswrch      \white
400 LDA #3
410 JSR oswrch
420 :
430 TYA             \Load ASCII value
440 SEC             \into accumulator and
450 SBC #65         \check if value is
460 BCC end         \less than 65
470 LDA #17         \If it is change text
480 JSR oswrch      \colour to yellow
490 LDA #2
500 JSR oswrch
510 :
520 .end            \Restore registers
530 PLA
540 TAY
550 PLA
560 TAX
```

Continued ▶

```
570 PLA
580 PLP
590 RTS             \Return
600 ]
610 NEXT pass
620 ENDPROC
```

Listing 5. How a single sound can be programmed

```
  1 REM Listing 5
 10 REM Sound using assembly language
 20 REM by Martin Phillips
 30 REM for BBC and Electron
 40 REM (c) Acorn User
 50 :
 60 PROCinitialise
 70 PROCassemble
 80 CALL &C00
 90 END
100 :
110 DEFPROCinitialise
120 code%=&C00
130 param=&70
140 osword=&FFF1
150 param!0=&FFF10001
160 param!4=&A0034
170 ENDPROC
180 :
190 DEFPROCassemble
200 P%=code%
210 [
220 LDX #&70    \lsb of parameter block
230 LDY #0      \msb of parameter block
240 LDA #7       \Put 7 into A
250 JSR osword \Do OSWORD with A=7
260 RTS
270 ]
280 ENDPROC
```

Listing 6. Program to play four notes

```
  1 REM Listing 6
 10 REM Sound four notes
 20 REM by Martin Phillips
 30 REM for BBC and Electron
 40 REM (c) Acorn User
 50 :
 60 PROCinitialise
 70 PROCassemble
 80 CALL &C00
 90 END
100 :
110 DEFPROCinitialise
120 code%=&C00
130 param=&70
140 osword=&FFF1
150 param!0=&FFF10001
160 param!4=&A0034
170 ENDPROC
180 :
190 DEFPROCassemble
200 FOR pass=0 TO 3 STEP 3
210 P%=code%
220 [
230 OPT pass
240 JSR sound           \Sound 1st note
250 :
260 LDA #&38            \Sound 2nd note
270 STA &74
280 JSR sound
290 :
300 LDA #&3C            \Sound 3rd note
310 STA &74
320 JSR sound
```

Continued ▶

◀ Continued

```
330 :
340 LDA #&40          \Sound 4th note
350 STA &74
360 JSR sound
370 RTS
380 :
390 .sound            \OSWORD call
400 LDX #&70
410 LDY #0
420 LDA #7
430 JSR osword
440 RTS
450 ]
460 NEXTpass
470 ENDPROC
```

Listing 7. How to program the speech synthesiser

```
  1 REM Listing 7
 10 REM Speak three words
 20 REM by Martin Phillips
 30 REM for BBC with speech synthesiser
 40 REM (c) Acorn User
 50 :
 60 PROCinitialise
 70 PROCassemble
 80 CALL &C00
 90 END
100 :
110 DEFPROCinitialise
120 param=&70
130 osword=&FFF1
140 param!0=&E3FFFF
150 param!4=0
160 ENDPROC
170 :
180 DEFPROCassemble
190 FOR pass=0 TO 3 STEP 3
200 P%=&C00
210 [
220 OPT pass
230 JSR sound       \Sound 1st word
240 :
250 LDA #&E4
260 STA &72
270 JSR sound       \Sound 2nd word
280 :
290 LDA #&F1
300 STA &72
310 JSR sound       \Sound 3rd word
320 RTS
330 :
340 .sound          \OSWORD call
350 LDX #&70
360 LDY #0
370 LDA #7
380 JSR osword
390 RTS
400 ]
410 NEXTpass
420 ENDPROC
```

Listing 8. Using the technique to provide a talking typewriter

```
  1 REM Listing 8
 10 REM Talking typewriter
 20 REM by Martin Phillips
 30 REM for BBC & speech synthesiser
 40 REM (c) Acorn User
 50 :
 60 PROCinitialise
 70 PROCassemble
 80 *FX14,2
 90 END
```

Continued ▶

```
100 :
110 DEFPROCinitialise
120 param=&70
130 osword =&FFF1
140 param!0=&FFFF
150 param!4=0
160 code%=&C00
170 ?&220=code% AND 255
180 ?&221=code% DIV 256
190 ENDPROC
200 :
210 DEFPROCassemble
220 FOR pass=0 TO 3 STEP 3
230 P%=code%
240 [
250 OPTpass
260 PHP              \Save registers
270 PHA
280 TXA
290 PHA
300 TYA
310 PHA
320 :
330 CPY #&30      \If Y<ASC"0"
340 BMI exit      \Go to exit
350 :
360 CPY #&7B      \If Y>ASC"z"
370 BPL exit      \Go to exit
380 :
390 CPY #&3A      \If Y>"9"
400 BMI speak     \Go to speak
410 :
420 CPY #&41      \If Y<"A"
430 BMI exit      \Go to exit
440 :
450 CPY #&5B      \If Y<ASC"Z"
460 BMI speak     \Go to speak
470 :
480 CPY #&61      \If Y<ASC"a"
490 BMI exit      \Go to exit
500 :
510 CLC           \Clear carry
520 TYA           \Transfer Y to A
530 SBC #&1F      \Subtract &1F from A
540 TAY           \Return A to Y
550 :
560 .speak
570 STY param+2 \Store ASC value in pa
ram block
580 LDX #&70      \lsb parameter block
590 LDY #0        \msb parameter block
600 LDA #7        \Load A with 7
610 JSR osword    \SOUND -1,n,0,0
620 :
630 .exit         \Restore registers
640 PLA
650 TAY
660 PLA
670 TAX
680 PLA
690 PLP
700 RTS           \Return from event
710 ]
720 NEXT pass
730 ENDPROC
```

Listing 9. Plays a six-note sequence every 30 seconds

```
  1 REM Listing 9
 10 REM Interrupt driven sound
 20 REM by Martin Phillips
 30 REM for BBC and Electron
 40 REM (c) Acorn User
 50 :
 60 PROCinitialise
 70 PROCassemble
```

Continued ▶

See 'Shining Example', page 72

◀ *Continued*

```
   80 *FX14,5
   90 CALL &C00
  100 END
  110 :
  120 DEFPROCinitialise
  130 param=&70
  140 clock=&78
  150 pitch=&80
  160 osword =&FFF1
  170 param!0=&FFF10001
  180 param!4=&000A0000
  190 pitch!0=&28586860
  200 pitch!4=&4444
  210 code%=&C00
  220 ?&220=code% AND 255
  230 ?&221=code% DIV 256
  240 clock?4=&FF
  250 clock!0=&FFFFF448
  260 ENDPROC
  270 :
  280 DEFPROCassemble
  290 FOR pass=0 TO 3 STEP 3
  300 P%=code%
  310 [
  320 OPT pass
  330 PHP           \Save registers
  340 PHA
  350 TXA
  360 PHA
  370 TYA
  380 PHA
  390 :
  400 LDA #4        \Set interval timer
  410 LDX #&78      \to 60 seconds
  420 LDY #0
  430 JSR osword
  440 :
  450 LDY #&FF      \Load Y with &FF
  460 :
  470 .loop         \Loop to process 6 sou
nds
  480 INY
  490 TYA
  500 CMP #6        \Check number of sound
s sent
  510 BEQ exit      \Branch to exit if six
 sounds sent
  520 LDA &80,Y     \Load next pitch param
eter
  530 STA param+4 \Put pitch in paramete
r store
  540 TYA
  550 PHA           \Save loop count
  560 LDX #param
  570 LDY #0
  580 LDA #7
  590 JSR osword    \SOUND 1,-15,pitch,10
  600 PLA
  610 TAY           \Restore loop count
  620 JMP loop
  630 :
  640 .exit
  650 PLA           \Restore registers
  660 TAY
  670 PLA
  680 TAX
  690 PLA
  700 PLP
  710 RTS
  720 ]
  730 NEXT pass
  740 ENDPROC
```

Listing 1. The Light Grapher program

```
    1 REM Light Grapher
    2 REM by Joe Telford
    3 REM for BBC B, B+
    4 REM (c) Acorn User August 1985
    5 :
   10 MODE1
   20 PROCsetup
   30 PROCcrsr(0)
   40 PROCscreen
   50 PROCfkeys
   60 ON ERROR PROCerr
   70 REPEAT
   80 PROCcommand
   90 UNTIL FALSE
  100 :
  110 DEFPROCcommand
  120 c$=INKEY$(0)
  130 IF INSTR(v$,c$)<1 OR c$="" ENDPROC
  131 VDU7
  140 IF c$="C" PROCclg
  150 IF c$="D" PROCdraw
  160 IF c$="R" GCOL0,1:col$="Red  "
  170 IF c$="W" GCOL0,3:col$="White"
  180 IF c$="B" GCOL0,2:col$="Blue "
  190 IF c$=">" x%=2
  200 IF c$="<" x%=1
  210 IF c$="^" y%=2
  220 IF c$="V" y%=1
  230 IF c$="X" CLS:PRINT''"done.":END
  231 PROCstatus
  240 ENDPROC
  250 :
  260 DEFPROCsetup
  270 *FX16,1
  280 *FX190,8,0
  290 x%=1:y%=1
  300 col$="White"
  301 v$="CDRWB><^VX"
  310 ENDPROC
  320 :
  330 DEFPROCerr
  340 IF ERR=17 ENDPROC
  350 CLS
  360 REPORT
  370 PRINT" at ";ERL
  380 END
  390 :
  400 DEFPROCclg
  410 CLG
  420 GCOL0,3
  430 MOVE0,512
  440 PLOT21,1280,512
  441 PROCstatus
  460 IF col$="Red  " GCOL0,1
  470 IF col$="Blue " GCOL0,2
  480 ENDPROC
  490 :
  491 DEFPROCstatus
  492 PRINTTAB(1,5);"X:";x%;" Y:";y%;" "
;col$
  493 ENDPROC
  500 DEFPROCdraw
  501 PROCclscom
  510 c=0
  520 REPEAT
  530 MOVEc,(FNldr*y%) MOD 512
  540 TIME=0:REPEAT UNTIL TIME=1
  550 c=c+(8/x%)
  560 DRAW c,(FNldr*y%) MOD 512
  570 UNTILc>1280
  571 PROCcoms
  580 ENDPROC
  590 :
  600 DEFFNldr:=ADVAL1 DIV 256
  610 :
  620 DEFPROCscreen
```

Continued ▶

```
   630 COLOUR130
   640 VDU19,2,4,0;0;0;
   650 GCOLO,2
   660 PROCrect(0,893,1279,128,1)
   670 PROCrect(0,0,1279,256,1)
   680 GCOLO,3
   690 PROCrect(0,0,1279,256,0)
   700 PROCrect(8,8,1262,240,0)
   710 PROCrect(0,893,1279,128,0)
   720 PROCrect(8,901,1262,111,0)
   730 PROCprint(8,1,"Acorn User Light Gr
apher")
   740 PROCcoms
   750 PROCgraphaxis
   760 ENDPROC
   770 :
   780 DEFPROCgraphaxis
   790 LOCALloop
   800 FOR loop = 0 TO 1264 STEP 16
   810 PROCrect(loop,272,16,610,0)
   820 NEXT
   830 FOR loop = 0 TO 594 STEP 16
   840 PROCrect(0,loop+272,1279,16,0)
   850 NEXT
   860 VDU24,16;288;1264;864;
   870 VDU29,16;288;
   880 MOVE 0,0
   890 PROCclg
   900 ENDPROC
   910 :
   920 DEFPROCcoms
   930 PROCprint(9,25,"Single letter Comm
ands")
   940 PRINTTAB(1,28)"CLR Draw Red Whte B
lue      Scales     "
   950 PRINTTAB(1,29)"All line Ink Ink   I
nk  X*2 X*1 Y*2 Y*1"
   960 PRINTTAB(1,30)"f0    f1  f2  f3    f
4   f5  f6  f7  f8"
   970 ENDPROC
   980 :
   990 DEFPROCprint(x,y,x$)
  1000 PRINTTAB(x,y);
  1010 FORloop= 1 TO LENx$
  1020 PROCbig(ASC(MID$(x$,loop,1)))
  1030 NEXT
  1040 ENDPROC
  1050 :
  1060 DEFPROCbig(char)
  1070 LOCALb%
  1080 b%=&70:?b%=char
  1090 A%=&A:X%=b%:Y%=0
  1100 CALL&FFF1
  1110 VDU23,128,b%?1,b%?1,b%?2,b%?2,b%?3
,b%?3,b%?4,b%?4
  1120 VDU128,8,10
  1130 VDU23,128,b%?5,b%?5,b%?6,b%?6,b%?7
,b%?7,b%?8,b%?8
  1140 VDU128,11
  1150 ENDPROC
  1160 :
  1170 DEFPROCrect(x,y,l,w,f)
  1180 MOVEx,y
  1190 IFf=0 DRAWx+l,y:DRAWx+l,y+w
  1200 IFf=0 DRAWx,y+w:DRAWx,y:ENDPROC
  1210 MOVEx+4,y
  1220 MOVEx+l,y
  1230 PLOT85,x+l,y+w
  1240 MOVEx,y
  1250 MOVEx,y+w
  1260 PLOT85,x+l-4,y+w
  1270 ENDPROC
  1280 :
  1290 DEFPROCclscom
  1300 VDU28,1,30,38,25,12,26
  1310 VDU24,16;288;1264;864;
  1320 VDU29,16;288;
  1330 MOVE0,0
  1340 ENDPROC
  1350 :
  1360 DEFPROCcrsr(x)
  1370 IFx=0 VDU23;8202;0;0;0;
  1380 IFx>0 VDU23;29194;0;0;0;
  1390 ENDPROC
  1400 :
  1410 DEFPROCfkeys
  1420 *KEY0 C
  1430 *KEY1 D
  1440 *KEY2 R
  1450 *KEY3 W
  1460 *KEY4 B
  1470 *KEY5 >
  1480 *KEY6 <
  1490 *KEY7 ^
  1500 *KEY8 V
  1510 *KEY9 X
  1520 ENDPROC
```

Listing 2. The torch receiver program

```
   10 REM  Torch Receiver
   20 REM  By Joe Telford
   30 REM  For BBC B, B+, Discs, Net
   40 REM  (c) Acorn User August 1985
   45 :
   50 MODE4
   60 PROCsetup
   70 PROCcrsr(0)
   80 PROCscreen
   90 ON ERROR PROCerr
  100 REPEAT
  110 choice=FNchoose
  120 IF choice=0 PROCsync
  130 IF choice=1 PROCmess
  140 UNTIL0
  150 :
  160 DEFPROCerr
  170 PROCclsinst
  180 IF ERR=17 ENDPROC
  190 VDU26,12
  200 REPORT
  210 PRINT" at ";ERL
  220 END
  230 :
  240 DEFPROCsetup
  250 *FX16,1
  260 *FX190,8,0
  270 DIM bit% 248
  280 choice=0
  290 ENDPROC
  300 :
  310 DEFPROCsync
  320 PROCstartsync
  330 PROCmeasuresync
  340 PROCendsync
  350 ENDPROC
  360 :
  370 DEFPROCstartsync
  380 T%=0:H%=0:L%=999
  390 PROCclsinst
  400 PROCprint(9,26,"Press SPACE when S
YNC")
  410 PROCprint(6,28,"signal is being tr
ansmitted")
  420 REPEAT UNTIL GET=32
  430 ENDPROC
  440 :
  450 DEFPROCmeasuresync
  460 PROCamplitude
  470 PROCperiod
  480 ENDPROC
  490 :
  500 DEFPROCamplitude
  510 TIME=0
  520 REPEAT
```

Continued ▶

◀ *Continued*

```
 530 A% = FNldr
 540 IF H% < A% H%=A%
 550 IF L% > A% L%=A%
 560 UNTIL TIME>100
 570 V%=L%+((H%-L%)*.5)
 580 ENDPROC
 590 :
 600 DEFPROCperiod
 610 LOCALcount%
 620 FORcount%=1 TO 2
 630 REPEAT UNTIL FNldr>V%
 640 TIME=0
 650 REPEAT UNTIL FNldr<V%
 660 REPEAT UNTIL FNldr>V%
 670 period%=TIME
 680 NEXT
 690 ENDPROC
 700 :
 710 DEFPROCendsync
 720 PROCclsinst
 730 PROCprint(8,27,"Waiting for end of
SYNC")
 740 REPEAT
 750 REPEAT UNTIL FNldr<V%
 760 TIME=0
 770 REPEAT UNTIL TIME>period% OR FNldr
>V%
 780 UNTIL FNldr<V%
 790 PROCclsinst
 800 PROCprint(12,27,"SYNC signal OK.")
 810 ENDPROC
 820 :
 830 DEFPROCmess
 840 PROCwsrx
 850 PROCgetrx
 860 PRINT
 870 IF FNcheckrx>0 ENDPROC
 880 PROCdecbits
 890 PROCdecbytes
 900 ENDPROC
 910 :
 920 DEFPROCwsrx
 930 PROCclsinst
 940 PROCprint(8,26,"Waiting for transm
ission")
 950 PROCprint(15,28,":")
 960 REPEAT UNTIL FNldr>V%:TIME=0
 970 ptr%=0
 980 ENDPROC
 990 :
1000 DEFPROCgetrx
1010 REPEAT
1020 ptr%=ptr%+1
1030 IF (ptr% MOD 8) = 0 PROCprint(17,2
8,STR$(ptr% DIV 8))
1040 REPEAT UNTIL FNldr<V%
1050 bit%?ptr%=TIME
1060 REPEAT UNTIL FNldr>V% OR TIME>(per
iod%*3)
1070 IF FNldr>V% THEN TIME=0
1080 UNTIL TIME>period%*3
1090 ENDPROC
1100 :
1110 DEFFNcheckrx
1120 LOCALerror%
1130 PROCclsinst
1140 PROCprint(9,26,"Transmission recei
ved.")
1150 PROCprint(16,28,"Decoding")
1160 error%=ptr% MOD 8
1170 IF error%>0 PROCrxerr
1180 =error%
1190 :
1200 DEFPROCrxerr
1210 PROCclsinst
1220 PROCprint(7,27,"Message error...Tr
y again.")
1230 ENDPROC
```

```
1240 :
1250 DEFFNldr=ADVAL1 DIV 256
1260 :
1270 DEFPROCdecbits
1280 LOCAL p%,lomark%,himark%
1290 lomark%=999:himark%=0
1300 FORp%=2 TO ptr%
1310 IF bit%?p%<lomark% lomark% = bit%?
p%
1320 IF bit%?p%>himark% himark% = bit%?
p%
1330 NEXT p%
1340 crit%=(himark%+lomark%)/2
1350 ENDPROC
1360 :
1370 DEFPROCdecbytes
1380 LOCALp%,mess%,count%,mess$
1390 mess$=""
1400 FOR p%=9 TO ptr% STEP 8
1410 mess%=0
1420 FOR count%= 0 TO 7
1430 mess%=mess%+(2^(7-count%))*(bit%?(
p%+count%)DIV crit%)
1440 NEXTcount%
1450 IF mess%<32 mess%=mess%+64
1460 mess$=mess$+CHR$(mess% AND 127)
1470 NEXTp%
1480 PROCclsinst
1490 PROCprint(5,27,CHR$128+mess$)
1500 VDU28,5,22,34,10
1510 PRINTTAB(0,12)mess$
1520 VDU26
1530 ENDPROC
1540 :
1550 DEFFNchoose
1560 *FX4,2
1570 *KEY13 R
1580 *KEY12 L
1590 GCOL4,1
1600 PROCprint(18,3,CHR$129+"   "+CHR$13
0)
1610 REPEAT
1620 A$=INKEY$(0)
1630 IF A$="L" AND choice=1 choice=FNbl
ock(0)
1640 IF A$="R" AND choice=0 choice=FNbl
ock(1)
1650 UNTIL A$=CHR$13
1660 *FX4,0
1670 PROCprint(18,3,STRING$(4," "))
1680 =choice
1690 :
1700 DEFFNblock(x)
1710 GCOL4,1
1720 PROCrect(204+600*(1-choice),838,27
4,120,1)
1730 PROCrect(204+600*(choice),838,274,
120,1)
1740 GCOL1,0
1750 =x
1760 ENDPROC
1770 :
1780 DEFPROCscreen
1790 VDU23,128,103,130,66,34,194,24,36,
24
1800 VDU23,129,16,48,127,255,255,127,48
,16
1810 VDU23,130,8,12,254,255,255,254,12,
8
1820 VDU19,0,4,0;0;0;
1830 PRINTTAB(1,1)"Acorn"
1840 PRINTTAB(1,2)"User"
1850 PRINTTAB(34,1)"Torch"
1860 PRINTTAB(35,2)"Rxer"
1870 PROCrect(0,0,1279,1023,0)
1880 PROCrect(8,8,1262,1004,0)
1890 PROCprint(7,3," Sync. ")
1900 PROCprint(26,3,"Message")
1910 PROCrect(200,834,282,128,0)
```

Continued ▶

◀ Continued

```
 1920 PROCrect(192,826,298,144,0)
 1930 PROCrect(800,834,282,128,0)
 1940 PROCrect(792,826,298,144,0)
 1950 PROCprint(5,27,"    Acorn User Torc
h Receiver")
 1960 PROCrect(128,32,1024,192,0)
 1970 PROCrect(120,24,1040,208,0)
 1980 GCOL4,1
 1990 PROCrect(204,838,272,120,1)
 2000 GCOL0,1
 2010 PROCrect(128,256,1024,544,0)
 2020 PROCrect(120,248,1040,560,0)
 2030 PROCprint(12,8,"Message Notepad")
 2040 ENDPROC
 2050 :
 2060 DEFPROCprint(x,y,x$)
 2070 PRINTTAB(x,y);
 2080 FOR loop = 1 TO LENx$
 2090 PROCbig(ASC(MID$(x$,loop,1)))
 2100 NEXTloop
 2110 ENDPROC
 2120 :
 2130 DEFPROCbig(char)
 2140 LOCALb%
 2150 b%=&70:?b%=char
 2160 A%=&A:X%=b%:Y%=0
 2170 CALL&FFF1
 2180 VDU23,133,b%?1,b%?1,b%?2,b%?2,b%?3
,b%?3,b%?4,b%?4
 2190 VDU133,8,10
 2200 VDU23,133,b%?5,b%?5,b%?6,b%?6,b%?7
,b%?7,b%?8,b%?8
 2210 VDU133,11
 2220 ENDPROC
 2230 :
 2240 DEFPROCrect(x,y,l,w,f)
 2250 MOVEx,y
 2260 IF f=0 DRAWx+l,y:DRAWx+l,y+w
 2270 IF f=0 DRAWx,y+w:DRAWx,y:ENDPROC
 2280 MOVEx+4,y
 2290 MOVEx+l,y
 2300 PLOT85,x+l,y+w
 2310 MOVEx,y
 2320 MOVEx,y+w
 2330 PLOT85,x+l-4,y+w
 2340 ENDPROC
 2350 :
 2360 DEFPROCclsinst
 2370 VDU28,5,29,35,26,12,26
 2380 ENDPROC
 2390 :
 2400 DEFPROCcrsr(x)
 2410 IFx=0 THEN VDU23;8202;0;0;0;
 2420 IFx<>0 THEN VDU23;29194;0;0;0;
 2430 ENDPROC
```

Listing 3. The torch transmitter program

```
  10 REM  Torch Transmitter.
  20 REM  by Joe Telford
  30 REM  for BBC B, B+, Disc and Net
  40 REM  (c) Acorn User August 1985
  50 :
  60 T=10 : REM alters timing
  70 :
  80 MODE4
  90 PROCsetup
 100 PROCcrsr(0)
 110 PROCscreen
 120 ON ERROR PROCerr
 130 REPEAT
 140 choice=FNchoose
 150 IF choice=0 PROCsync
 160 IF choice=1 PROCsend(FNmess)
 170 UNTIL FALSE
 180 :
 190 DEFPROCsetup
 200 DIM bit(7)
 210 mesval=1
 220 ENDPROC
 230 :
 240 DEFPROCerr
 250 COLOUR128
 260 COLOUR1
 270 PROCclsinst
 280 *MOTOR 0
 290 IF ERR=17 ENDPROC
 300 CLS
 310 REPORT
 320 PRINT" at ";ERL
 330 END
 340 :
 350 DEFFNmess
 360 LOCALch
 370 PROCsetmess
 380 ch=FNselmess
 390 IFch=messages THEN = FNinmess
 400 =CHR$128+mess$(ch)
 410 :
 420 DEFPROCsetmess
 430 VDU23,131,24,60,126,255,60,60,60,6
0
 440 VDU23,132,60,60,60,60,255,126,60,2
4
 450 PROCprint(38,14,CHR$131)
 460 PROCprint(38,20,CHR$132)
 470 *FX4,2
 480 *KEY 15 "U"
 490 *KEY 14 "D"
 500 ENDPROC
 510 :
 520 DEFFNselmess
 530 REPEAT
 540 COLOUR129
 550 COLOUR0
 560 PROChilite(mesval)
 570 COLOUR128
 580 COLOUR1
 590 A$=GET$
 600 IF A$="U" AND mesval>1 PROCnormal(
mesval):mesval=mesval-1
 610 IF A$="D" AND mesval<messages PROC
normal(mesval):mesval=mesval+1
 620 UNTIL A$ = CHR$13
 630 PROCprint(38,14," ")
 640 PROCprint(38,20," ")
 650 *FX4,0
 660 =mesval
 670 :
 680 DEFFNinmess
 690 PROCclsinst
 700 PROCprint(5,26,"Enter message")
 710 PROCprint(18,28,"then press RETURN
")
 720 PRINTTAB(5,messages+10);
 730 = FNgpi(29)
 740 :
 750 DEFPROChilite(m)
 760 COLOUR129
 770 COLOUR0
 780 PRINTTAB(5,m+10);mess$(m);
 790 PRINTSTRING$(30-LENmess$(m)," ")
 800 COLOUR128
 810 COLOUR1
 820 ENDPROC
 830 :
 840 DEFPROCnormal(m)
 850 COLOUR128
 860 COLOUR1
 870 PRINTTAB(5,m+10);mess$(m);
 880 PRINTSTRING$(30-LENmess$(m)," ")
 890 COLOUR129
 900 COLOUR0
```

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```
  910 ENDPROC
  920 :
  930 DEFPROCsync
  940 PROCclsinst
  950 PROCprint(11,26,"Transmitting SYNC
")
  960 PROCprint(11,28,"(any key to stop)
")
  970 tot=0
  980 REPEAT
  990 PROCtx(T,"0")
 1000 PROCtx(T,"1")
 1010 tot=tot+T+T
 1020 UNTIL INKEY(0)>0 OR tot>500
 1030 PROCtx(T,"0")
 1040 PROCclsinst
 1050 ENDPROC
 1060 :
 1070 DEFPROCsend(string$)
 1080 PROCclsinst
 1090 LOCAL char%
 1100 FOR char%=1 TO LENstring$
 1110 let$ = MID$(string$,char%,1)
 1120 PROCasc(let$)
 1130 PROCtxbyte
 1140 PROCprint(4+char%,27,let$)
 1150 NEXTchar%
 1160 ENDPROC
 1170 :
 1180 DEFPROCasc(C$)
 1190 LOCAL C%,loop%
 1200 C%=ASC(C$)
 1210 FOR loop%= 7 TO 0 STEP -1
 1220 bit(loop%)=(C% MOD 2)+1
 1230 C%=C% DIV 2
 1240 NEXT loop%
 1250 ENDPROC
 1260 :
 1270 DEFPROCtxbyte
 1280 LOCAL loop%
 1290 FOR loop%= 0 TO 7
 1300 PROCtx(T*bit(loop%),"1")
 1310 PROCtx(T,"0")
 1320 NEXTloop%
 1330 ENDPROC
 1340 :
 1350 DEFPROCtx(X%,bit$)
 1360 TIME=0
 1370 IF bit$= "0" THEN *MO. 0
 1380 IF bit$= "1" THEN *MO. 1
 1390 REPEAT UNTIL TIME=X%
 1400 ENDPROC
 1410 :
 1420 DEFFNchoose
 1430 *FX4,2
 1440 *KEY13 R
 1450 *KEY12 L
 1460 GCOL4,1
 1470 PROCprint(18,3,CHR$129+"  "+CHR$13
0)
 1480 REPEAT
 1490 A$=INKEY$(0)
 1500 IF A$="L" AND choice=1 choice=FNbl
ock(0)
 1510 IF A$="R" AND choice=0 choice=FNbl
ock(1)
 1520 UNTIL A$=CHR$13
 1530 *FX4,0
 1540 PROCprint(18,3,STRING$(4," "))
 1550 =choice
 1560 :
 1570 DEFFNblock(x)
 1580 GCOL4,1
 1590 PROCrect(204+600*(1-choice),838,27
4,120,1)
 1600 PROCrect(204+600*(choice),838,274,
120,1)
 1610 GCOL1,0
 1620 =x
 1630 :
 1640 DEFPROCscreen
 1650 VDU23,128,103,130,66,34,194,24,36,
24
 1660 VDU23,129,16,48,127,255,255,127,48
,16
 1670 VDU23,130,8,12,254,255,255,254,12,
8
 1680 VDU19,0,1,0;0;0
 1690 PRINTTAB(1,1)"Acorn"
 1700 PRINTTAB(1,2)"User"
 1710 PRINTTAB(34,1)"Torch"
 1720 PRINTTAB(35,2)"Txer"
 1730 PROCrect(0,0,1279,1023,0)
 1740 PROCrect(8,8,1262,1004,0)
 1750 PROCprint(7,3," Sync. ")
 1760 PROCprint(26,3,"Message")
 1770 PROCrect(200,834,282,128,0)
 1780 PROCrect(192,826,298,144,0)
 1790 PROCrect(800,834,282,128,0)
 1800 PROCrect(792,826,298,144,0)
 1810 PROCprint(5,27," Acorn User Torch
Transmitter.")
 1820 PROCrect(128,32,1024,192,0)
 1830 PROCrect(120,24,1040,208,0)
 1840 GCOL4,1
 1850 PROCrect(204,838,272,120,1)
 1860 GCOL0,1
 1870 PROCrect(128,256,1024,544,0)
 1880 PROCrect(120,248,1040,560,0)
 1890 PROCprint(12,8,"Standard Messages"
)
 1900 DATA 12
 1910 DATA Hello
 1920 DATA Are you receiving me?
 1930 DATA Please reply
 1940 DATA Over
 1950 DATA My name is
 1960 DATA Ten-four
 1970 DATA Roger
 1980 DATA Over and out
 1990 DATA Acorn User rules ok!
 2000 DATA 10101101 = &AD
 2010 DATA Welcome to Cleverland
 2020 DATA ............................
.
 2030 READ messages
 2040 DIMmess$(messages)
 2050 FOR loop=1 TO messages
 2060 READmess$(loop)
 2070 mess$(loop)=LEFT$(mess$(loop),29)
 2080 PRINTTAB(5,10+loop);mess$(loop)
 2090 NEXTloop
 2100 ENDPROC
 2110 :
 2120 DEFPROCprint(x,y,x$)
 2130 LOCALloop%
 2140 PRINTTAB(x,y);
 2150 FOR loop% = 1 TO LENx$
 2160 PROCbig(ASC(MID$(x$,loop%,1)))
 2170 NEXT loop%
 2180 ENDPROC
 2190 :
 2200 DEFPROCbig(char)
 2210 LOCALb%
 2220 b%=&70:?b%=char
 2230 A%=&A:X%=b%:Y%=0
 2240 CALL&FFF1
 2250 VDU23,133,b%?1,b%?1,b%?2,b%?2,b%?3
,b%?3,b%?4,b%?4
 2260 VDU133,8,10
 2270 VDU23,133,b%?5,b%?5,b%?6,b%?6,b%?7
,b%?7,b%?8,b%?8
 2280 VDU133,11
 2290 ENDPROC
 2300 :
 2310 DEFPROCrect(x,y,l,w,f)
 2320 MOVEx,y
```

Continued ▶

See 'Drawing Your Own Conclusions', page 80

◀ *Continued*

```
 2330 IF f=0 DRAWx+1,y:DRAWx+1,y+w
 2340 IF f=0 DRAWx,y+w:DRAWx,y:ENDPROC
 2350 MOVEx+4,y
 2360 MOVEx+1,y
 2370 PLOT85,x+1,y+w
 2380 MOVEx,y
 2390 MOVEx,y+w
 2400 PLOT85,x+1-4,y+w
 2410 ENDPROC
 2420 :
 2430 DEFPROCclsinst
 2440 VDU28,5,29,35,26,12,26
 2450 ENDPROC
 2460 :
 2470 DEFPROCcrsr(x)
 2480 IF x=0 THEN VDU23;8202;0;0;0;
 2490 IF x<>0 THEN VDU23;29194;0;0;0;
 2500 ENDPROC
 2510 :
 2520 DEFFNgpi(l)
 2530 LOCALa$,b
 2540 a$=""
 2550 COLOUR129
 2560 COLOUR0
 2570 PRINTSTRING$(1,".");STRING$(1,CHR$
(8));
 2580 *FX21,0
 2590 REPEAT
 2600 b=GET
 2610 IF b=13 THEN UNTIL TRUE:COLOUR128:
COLOUR1: = CHR$(128) + a$
 2620 IF b=127 AND a$="" UNTIL FALSE
 2630 IF b=127 a$=LEFT$(a$,LEN(a$)-1):PR
INTCHR$b;".";CHR$(8);:UNTIL FALSE
 2640 IF LEN(a$)=1 OR b<32 OR b>127 VDU7
:UNTIL FALSE
 2650 PRINTCHR$b;
 2660 a$=a$+CHR$b
 2670 UNTIL FALSE
```

Listing 1. Martin Phillips' Easyplot program

```
    1 REM Listing 1
   10 REM Easyplot program 1
   20 REM Martin Phillips
   30 REM For BBC and Electron
   40 REM (c) Acorn User August 1985
   50 :
   60 MODE 1
   70 PROCinitialise
   80 PROCdefine
   90 *FX11,0
  100 X%=640:Y%=540
  110 MODE 4
  120 VDU19,0,6,0,0,0,19,1,4,0,0,0
  130 CHAIN"PLOT2"
  140 END
  150 :
  160 DEFPROCinitialise
  170 *KEY10 O.|M|NL.|M
  180 *FX20,0
  190 *FX4,1
  200 R%=PAGE:C%=1
  210 DIM B 25,C(8)
  220 VDU19,0,6,0,0,0
  230 VDU19,3,4,0,0,0
  240 VDU19,2,0,0,0,0
  250 VDU23;8202;0;0;0;
  260 COLOUR 1
  270 PROCdouble("Easyplot",15,2)
  280 COLOUR 3
  290 ENDPROC
  300 :
  310 DEF PROCdefine
  320 PRINT'''"Do you want user defined ch
aracters?"
  330 A$=GET$
  340 IFA$<>"Y" THEN ENDPROC
  350 VDU26,12,18,4,1
  360 FOR N=32 TO 416 STEP 48
  370 MOVE N,608:DRAW N,992
  380 NEXT N
  390 FOR N=608 TO 992 STEP 48
  400 MOVE 32,N:DRAW 414,N
  410 NEXT N
  420 PRINTTAB(22,1)"SHIFT  CTRL"
  430 FOR y=0 TO 9
  440 FOR x=0 TO 1
  450 PRINTTAB(18,4+y*2)"f";y;
  460 C%=128+x*16+y
  470 PROCdrawchar(3)
  480 NEXT x,y
  490 COLOUR 1
  500 PROCdouble("Easyplot",3,15)
  510 PROCdouble("character",3,18)
  520 PROCdouble("definer",3,21)
  530 COLOUR 3
  540 x%=32:y%=608
  550 PRINTTAB(4,27)"Press function key to
 be defined,"
  560 PRINTTAB(4,28)"or press L to load de
finitions,"
  570 PRINTTAB(4,29)"or press S to save de
finitions"
  580 PRINTTAB(4,30)"or press E to end"
  590 A$=GET$
  600 IF A$="E" THEN ENDPROC
  610 IF A$="S" THEN PROCsave:GOTO350
  620 IF A$="L" THEN PROCload:GOTO350
  630 C%=ASC(A$)
  640 IF C%<128 THEN GOTO590
  650 PROCpix
  660 REPEAT
  670 PROCgetkey
  680 UNTIL key=67 OR key=83
  690 IF key=83 THEN GOTO350
  700 VDU23,C%,0,0,0,0,0,0,0,0
  710 GOTO350
  720 :
  730 DEF PROCsave
  740 PROCgetfilename
  750 $B="*SAVE "+T$+" C00 CFF"
  760 PROCcli
  770 VDU26
  780 ENDPROC
  790 :
  800 DEF PROCload
  810 PROCgetfilename
  820 $B="*LOAD "+T$
  830 PROCcli
  840 VDU26
  850 ENDPROC
  860 :
  870 DEF PROCgetkey
  880 COLOUR 2
  890 IF C%<143 THEN PRINTTAB(22,1)"SHIFT"
:ELSEPRINTTAB(29,1)"CTRL"
  900 PRINTTAB(18,4+(C% MOD16)*2)"f";C% MO
D16;
  910 PROCdrawchar(2)
  920 PRINTTAB(4,27)"Use cursor keys to mo
ve cross"SPC(9)
  930 PRINTTAB(4,28)"Press SPACE to define
"SPC(16)
  940 PRINTTAB(4,29)"Press S to store defi
nition"SPC(16)
  950 PRINTTAB(4,30)"Press C to clear defi
nition"SPC(16);
  960 VDU5
  970 PROCcross(x%,y%)
  980 key=GET
  990 oldx%=x%:oldy%=y%
 1000 IFkey=&88 ANDx%>32  THEN x%=x%-48
 1010 IFkey=&89 ANDx%<368 THEN x%=x%+48
```

Continued ▶

◀ Continued

```
1020 IFkey=&8B ANDy%<944 THEN y%=y%+48
1030 IFkey=&8A ANDy%>608 THEN y%=y%-48
1040 PROCcross(oldx%,oldy%)
1050 VDU4
1060 IF key=67 OR key=83 THEN ENDPROC
1070 IF key=&20 THEN PROCsquare:ENDPROC
1080 GOTO960
1090 :
1100 DEF PROCblock(X,Y,scale)
1110 VDU24,X;Y;X+scale;Y+scale;16,26
1120 ENDPROC
1130 :
1140 DEF PROCcross(x%,y%)
1150 VDU18,4,1,25,4,x%+8;y%+36;43
1160 ENDPROC
1170 :
1180 DEF PROCsquare
1190 VDU18,4,129,24,x%+4;y%+4;x%+44;y%+44
;16,26
1200 X%=8-(x%/48):Y%=(y%/48)-11
1210 IF POINT(x%+8,y%+8)=3 THEN C(Y%)=C(Y
%)+2^X%
1220 IF POINT(x%+8,y%+8)=0 THEN C(Y%)=C(Y
%)-2^X%
1230 VDU23,C%,C(8),C(7),C(6),C(5),C(4),C(
3),C(2),C(1)
1240 PROCdrawchar(1)
1250 ENDPROC
1260 :
1270 DEF PROCpix
1280 X%=0:Y%=13:A%=10:D=&D00
1290 ?D=C%:CALL&FFF1
1300 FOR y=0 TO 7
1310 FOR x=0 TO 7
1320 x%=32+x*48
1330 y%=608+y*48
1340 IF((D?(8-y))AND 2^(7-x))=0 THEN GOTO
1360
1350 VDU18,4,129,24,x%+4;y%+4;x%+44;y%+44
;16,26
1360 NEXT x,y
1370 FOR N=1 TO 8
1380 C(9-N)=D?N
1390 NEXT N
1400 ENDPROC
1410 :
1420 DEF PROCcli
1430 X%=B MOD256
1440 Y%=B DIV256
1450 CALL&FFF7
1460 ENDPROC
1470 :
1480 DEF PROCgetfilename
1490 VDU28,0,31,37,27,12
1500 PRINT"Enter file name "
1510 PRINT"max 7 letters ";
1520 INPUT T$
1530 T$=LEFT$(T$,7)
1540 ENDPROC
1550 :
1560 DEF PROCdrawchar(col)
1570 LOCAL x,y
1580 COLOUR col
1590 x=24+(C% DIV143)*6
1600 y=4+(C% MOD16)*2
1610 PRINTTAB(x,y)CHR$(C%)
1620 COLOUR 3
1630 ENDPROC
1640 :
1650 DEFPROCdouble(A$,x,y)
1660 X%=0:Y%=13:A%=10:D=&D00
1670 C$=CHR$(240)+CHR$8+CHR$10+CHR$(241)
1680 FOR N=1 TO LEN(A$)
1690 B$=MID$(A$,N,1):?D=ASC(B$):CALL&FFF1
1700 VDU23,240,D?1,D?1,D?2,D?2,D?3,D?3,D?
4,D?4
1710 VDU23,241,D?5,D?5,D?6,D?6,D?7,D?7,D?
8,D?8
1720 PRINT TAB(x+N-1,y)C$:NEXT N
1730 ENDPROC
```

Listing 2. The PLOT 2 graphics program

```
1 REM Listing 2
10 REM Easyplot:-PLOT2
20 REM Martin Phillips
30 REM For BBC and Electron
40 REM (c) Acorn User 1985
50 :
60ON ERROR PROCm:PROCl:PRINTTAB(0,29)
"Select mode (0,1,2,4 or 5)";:PROCg:K=IN
STR("01245RC",A$):ONK GOTO70,70,70,70,70
,1210,410
70M%=VALA$:MODEM%:PROCs:CLS:N%=2^(1+M
%MOD3):PROCd:ONERRORGOTO1190
80REPEAT:x%=X%:y%=Y%:PROCf(x%,y%):PRO
Ca:PROCi:PROCf(x%,y%):IFA$=""GOTO120
90CLS:K=INSTR("DASEWX@LRCIMPFZ",A$):G
=0:IFK=0GOTO120
100IFK>9ANDZ%>J%:PROCm:GOTO120
110ONK GOSUB130,140,150,190,210,1230,2
30,240,250,260,270,290,340,380,160
120COLOURn%:PRINTTAB(0,0)"Command?":GC
OL0,C%:PROCl:UNTIL0
130FORT=0TOn%:REPEAT:PRINT"Colour ";T:
PROCg:A?T=VALA$:UNTILT<>n%ORVALA$<>?A:NE
XT:PROCv:RETURN
140REPEATPROCt:PRINT'"Which colour now
";:PROCg:C%=VALA$:UNTILC%<=n%:RETURN
150PROCh:IFS%=0PROCsa:RETURN:ELSE$&CE0
="DEL."+T$:X%=&E0:Y%=&C:CALL&FFF7:PROCsa
:RETURN
160PROCh:O=OPENUP(T$):INPUT£O,a%:IFZ%+
a%>J%THENPROCm:CLOSE£O:RETURN
170FORI=Z%TOZ%+a%-1:A?I=BGET£O:NEXT:N=
0:IFZ%>8THENN=Z%
180Z%=Z%+a%:PROCq(N,N,8):CLOSE£O:G=1
190IFZ%=8:CLG:RETURN:ELSEFORI=GTO1:PRO
Cv:GCOL0,128:CLG:N=8:GCOL0,n%:PROCl:REPE
AT:PROCr(N):N1=FNa:PROCty(N,0,0):IFI=0PR
INT"This step OK?":PROCg:IFA$="N"PROCq(1
,N,N1):N=N-N1
200N=N+N1:UNTILN>=Z%:NEXT:X%=640:Y%=54
0:RETURN
210PRINT"OK to clear screen?":PROCg:IF
A$="Y":PROCd:CLG:ELSEPRINT"OK to clear m
emory?":PROCg:IFA$="Y":Z%=8
220RETURN
230PRINT'"Memory left..."J%-Z%:RETURN
240B%=1:PROCe:PROCp:REPEAT:PROCa:PROCl
i(6+D%):PROCi:PROCli(6+D%):UNTILA$=" ":P
ROCli(5+D%):PROCb:RETURN
250B%=2:PROCe:PROCp:REPEAT:PROCa:PROCr
e(6+D%):PROCi:PROCre(6+D%):UNTILA$=" ":P
ROCre(5+D%):PROCb:RETURN
260B%=3:INPUT"Number of sides "P%:PROC
e:PROCp:PROCf(x%,y%):REPEAT:PROCa:PROCf(
X%,Y%):PROCci(6+D%):PROCi:PROCci(6+D%):P
ROCf(X%,Y%):UNTILA$=" ":PROCf(x%,y%):PLO
T69,x%,y%:PROCb:PROCci(5+D%):RETURN
270B%=4:f(0,0)=C%:f(0,1)=C%:f(1,1)=C%:
f(1,0)=C%:IFn%>1:PROCk
280REPEAT:y%=y%+4:UNTILPOINT(x%,y%)<>0
:y%=y%-8:Y1%=y%:X1%=x%:PROCfi:y%=Y1%:x%=
X1%:PROCb:RETURN
290IFZ%=8:RETURN:ELSEvx=x%:vy=y%:st=0:
GCOL0,0:CLG:GCOL0,n%:PROCl:N=8:V%=0:REPE
AT:PROCr(N):N1=FNa:PROCty(N,0,0):IFst=0:
PRINT"Start move here?":PROCg:IFA$="Y"TH
ENst=N:sx=x%:sy=y%
300IFV%>6:st=0
```

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```
310N=N+N1:en=N:IFst>0PRINT"End move here?":PROCg:IFA$="Y"N=Z%
320UNTILN>=Z%:IFst>0:x%=st:X%=en:D%=8:B%=15:PROCb
330G=1:GOSUB190:RETURN
340B%=16:ps=1:PRINT"Double height Y/N":PROCg:IFA$="Y"ps=2
350PRINT"Vertical Y/N":PROCg:INPUTLINE"Enter print"'P$:CLS:IFA$="Y"p$="":FORN=1TOLENP$:p$=p$+MID$(P$,N,1)+CHR$10+CHR$8:NEXT:P$=p$
360IFZ%+8+LENP$>J%THENPROCm:RETURN
370PROCp:REPEAT:PROCa:x%=X%:y%=Y%:PROCpr(4,ps):PROCi:PROCpr(4,ps):UNTILA$=" ":D%=1+LENP$:X%=ps:PROCb:PROCpr(0,X%):X%=x%:RETURN
380IFJ%-Z%<76THENPROCm:RETURN:ELSEPRINT"Follow mode":B%=17:PROCp:t=0:x%=X%:y%=Y%:MOVEx%,y%:REPEAT:x1%=X%:y1%=Y%:REPEAT:PROCa:PROCi:UNTILABS(x1%-X%)>N%ORABS(y1%-Y%)>40ORA$=" ":F?t=X%DIV256:F?(t+1)=X%MOD256:F?(t+2)=Y%DIV4
390t=t+3:DRAWX%,Y%:UNTILA$=" "ORt=75:D%=t:PROCb:IFt=75GOTO380
400RETURN
410M%=4:PROCs:CLS:PROCd:PROCh:O=OPENUP(T$):INPUT£O,Z%:FORI=0 TOZ%:A?I=BGET£O:NEXT:CLOSE£O:PROCh:PROCsa:RUN
420DEFPROCsa:O=OPENOUT(T$):PRINT£O,Z%:FORI=0TOZ%-1:BPUT£O,A?I:NEXT:CLOSE£O:CLS:ENDPROC
430DEFPROCmo(x,y,s,e):LOCALs1:REPEAT:PROCr(s):s1=FNa:PROCty(s,x,y):s=s+s1:UNTILs>e-1:ENDPROC
440DEFPROCli(K):MOVEx%,y%:PLOTK,X%,Y%:ENDPROC
450DEFPROCre(K):MOVEx%,y%:PLOTK,X%,y%:PLOTK,X%,Y%:PLOTK,x%,Y%:PLOTK,x%,y%:ENDPROC
460DEFPROCci(K):cs=2*PI/P%:cr=SQR((Y%-y%)^2+(X%-x%)^2):IFcr<2*N%THENENDPROC:ELSEca=ATN((X%-x%)/(0.5+Y%-y%)):IFY%<y%THENca=ca+PI:ELSEIFX%<x%THENca=ca+2*PI
470MOVEX%,Y%:FORcn=1TOP%:PLOTK,x%+cr*SIN(ca+cn*cs),y%+cr*COS(ca+cn*cs):NEXT:ENDPROC
480DEFPROCpr(pc,d):LOCALX%,Y%:VDU5,18,pc,C%,25,4,x%;y%+32*d;:IFd=1:PRINTP$:VDU4:ENDPROC
490A%=10:X%=0:Y%=10:p=&A00:FORpb%=1TOLENP$:p$=MID$(P$,pb%,1):IFp$<" ":VDU10,8,10:pb%=pb%+1:GOTO500:ELSE?p=ASCp$:CALL&FFF1:VDU23,240,p?1,p?1,p?2,p?2,p?3,p?3,p?4,p?4:VDU23,241,p?5,p?5,p?6,p?6,p?7,p?7,p?8,p?8,240,8,10,241,11;
500NEXT:VDU4:ENDPROC
510DEFPROCty(a%,ax,ay):GCOL0,C%:IFB%=15V%=V%+1:PROCmo(ax+A!(a%+8),ay+A!(a%+12),x%,X%):ENDPROC
520x%=x%+ax:y%=y%+ay:IFB%<4X%=X%+ax:Y%=Y%+ay
530IFB%=1:PROCli(D%+5)
540IFB%=2:PROCre(D%+5)
550IFB%=3:P%=D%MOD160:D%=16*(D%DIV160):PROCci(D%+5)
560IFB%=4:f(0,0)=A?(a%+4):f(1,0)=A?(a%+5):f(0,1)=A?(a%+6):f(1,1)=A?(a%+7):PROCfi
570IFB%=16:P$=$(A+a%+8):PROCpr(0,X%)
580IFB%=17:MOVEx%,y%:FORi=a%+8TOD%+7+a%STEP3:DRAWax+256*(A?i)+A?(i+1),ay+4*(A?(i+2)):NEXT
590ENDPROC
600DEFFNa=8+D%*(B%DIV10)
610DEFPROCa:IFINKEY(-1)i=4ELSEi=1
620IFINKEY(-122)X%=X%+N%*i
630IFINKEY(-26)X%=X%-N%*i
640IFINKEY(-42)Y%=Y%-4*i
650IFINKEY(-58)Y%=Y%+4*i
660IFINKEY(-90):CLS:INPUT"Enter X "X%"Enter Y "Y%:CLS:X%=N%*(X%DIVN%):Y%=4*(Y%DIV4)
670IFY%<96Y%=96:ELSEIFY%>1020Y%=1020
680IFX%<0:X%=0ELSEIFX%>1280:X%=1280
690PRINTTAB(0,2)"X="X%;" Y="Y%;"    ";:ENDPROC
700DEFPROCb:CLS:A?Z%=8*B%+C%:A?(Z%+1)=x%DIV256:A?(Z%+2)=x%MOD256:A?(Z%+3)=y%DIV4:A?(Z%+4)=X%DIV256:A?(Z%+5)=X%MOD256:A?(Z%+6)=Y%DIV4:A?(Z%+7)=D%:IFB%=3THENA?(Z%+7)=P%+10*D%
710IFB%=4THENA?(Z%+4)=f(0,0):A?(Z%+5)=f(1,0):A?(Z%+6)=f(0,1):A?(Z%+7)=f(1,1)
720IFB%=15:A!(Z%+8)=vx-sx:A!(Z%+12)=vy-sy
730IFB%=16:$(A+Z%+8)=P$
740IFB%=17:FORi=0TOD%-1:A?(Z%+i+8)=F?i:NEXT
750Z%=Z%+FNa:ENDPROC
760DEFPROCc:PRINT"Which drive?";:PROCg:*D.
770*DR.0
780IFVALA$=1:*DR.1
790IFVALA$=2:*DR.2
800IFVALA$=3:*DR.3
810ENDPROC
820DEFPROCd:VDU23;8202;0;0;0;:n%=N%-1:IFM%>3n%=(N%/2)-1
830C%=n%:FORI=0TO7:A?I=I:NEXT:A?n%=7:IFn%=3 A?2=3
840Z%=8:@%=0:FORi=0TOn%:VDU19,i,(A?i);0;:VDU19,i+8,(A?i);0;:NEXT:VDU28,0,31,(160/N%)-1,29:PROCl:ENDPROC
850DEFPROCe:D%=0:PRINT"Solid or dotted S/D";:PROCg:IFA$="D"THEND%=16
860ENDPROC
870DEFPROCf(x,y):MOVEx-16,y:PLOT6,x+16,y:MOVEx,y-16:PLOT6,x,y+16:ENDPROC
880DEFPROCg:A$=GET$:PROCj:CLS:ENDPROC
890DEFPROCh:IFPAGE=&E00:S%=0:GOTO920
900REPEATPRINT"Tape or Disc (T/D)":PROCg:UNTILA$="D"ORA$="T"
910IFA$="D":PROCc:S%=1:ELSES%=0:*T.
920IFS%=0THEN*OPT1,1
930IFS%=0THEN*OPT2,1
940INPUT"Enter title "T$:T$=LEFT$(T$,7):ENDPROC
950DEFPROCi:A$=INKEY$(2):PROCj:ENDPROC
960DEFPROCj:IFA$<>"":a=ASCA$:IFa>96ANDa<123:A$=CHR$(a-32):ELSEIFa>32ANDa<48:A$=CHR$(a+16)
970ENDPROC
980DEFPROCk:FORn=0TO1:FORN=0TO1:PROCo:PRINTTAB(5,2)"Colour for "CHR$(65+N+2*n);:REPEAT:PROCg:f(N,n)=VALA$:UNTILf(N,n)>0ANDf(N,n)<n%+1:NEXT,:PROCo:ENDPROC
990DEFPROCl:MOVE0,96:DRAW1279,96:DRAW1279,1023:DRAW0,1023:DRAW0,96:ENDPROC
1000DEFPROCm:CLS:PRINT"NO MEMORY LEFT":PROCn:CLS:ENDPROC
1010DEFPROCn:PRINT'"Press space bar";:A$=GET$:ENDPROC
1020DEFPROCo:FORn1=0TO1:FORn2=0TO1:COLOURf(n2,n1):F$=CHR$(65+n2+2*n1):PRINTTAB(n2,n1)F$:NEXT,:PROCt:ENDPROC
1030DEFPROCp:PRINT"Press space to end":ENDPROC
1040DEFPROCq(qt,qn,qs):LOCALq:FORq=qn TOZ%:A?q=A?(q+qs):NEXT:Z%=Z%-qs:IFqt=0:ENDPROC:ELSE:q=qn:REPEAT:PROCr(q):IFB%=15:PROCq(0,q,16):PRINT"Move deleted"
1050q=q+FNa:UNTILq>=Z%:ENDPROC
1060DEFPROCr(a%):B%=(A?a%)DIV8:C%=(A?a%)MOD8:x%=256*(A?(a%+1))+A?(a%+2):y%=4*(A?(a%+3)):X%=256*(A?(a%+4))+A?(a%+5):Y%=4*(A?(a%+6)):D%=A?(a%+7):ENDPROC
```

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```
 1070DEFPROCs:J%=HIMEM-(TOP+1500):DIMA (
J%-24),F 75,f(1,1),Q%(75),P% 30:f%=P%+20
:[:OPTO:.f6%:LDX£f%MOD256:LDY£f%DIV256:L
DA£&D:JSR&FFF1:RTS:]:ENDPROC
 1080DEFPROCt:PRINTTAB(5,0)"Colours";:FO
RT=0TOn%:COLOURT:PRINTT;:NEXT:ENDPROC
 1090DEFPROCv:FORT=0TOn%:VDU19,T,(A?T);0
;:NEXT:ENDPROC
 1100DEFPROCfi:LOCALX%,Y%:f1%=1:f2%=0:PR
OCfa(x%):REPEAT:f3%=Q%(f1%):f4%=Q%(f1%+2
5):y%=4+Q%(f1%+50):f1%=(f1%+1)MOD25:PROC
fc:y%=y%-8:PROCfc:UNTILf1%=f2%+1:ENDPROC
 1110DEFPROCfc:z=POINT(f3%,y%):IFz=-1 EN
DPROC:ELSEIFz=0f8%=f3%:ELSEPROCfb(f3%)
 1120IFf8%>f4%-N%ENDPROC
 1130REPEAT:PROCfa(f8%):PROCfb(f8%):UNTI
Lf8%>f4%-N%:ENDPROC
 1140DEFPROCfa(x%):PLOT76,x%,y%:CALLf6%:
f2%=(f2%+1)MOD25:Q%(f2%)=!f%AND&FFFF:Q%(
f2%+25)=f%!4AND&FFFF:PROCfd(Q%(f2%),Q%(f
2%+25)):Q%(f2%+50)=y%:ENDPROC
 1150DEFPROCfb(f10%):PLOT92,f10%,y%:CALL
f6%:f8%=N%+f%!4AND&FFFF:IFf8%>f4%PROCfd(
f10%,f4%)ELSEPROCfd(f10%,f8%-N%)
 1160ENDPROC
 1170DEFPROCfd(f10%,f11%):Y%=(y%DIV4)MOD
2:X%=(f10%DIVN%)MOD2:IFPOINT(f11%,y%)=0:
GCOL0,f(X%,Y%):PLOT77,f11%,y%:GCOL0,f((X
%+1)MOD2,Y%):MOVEf10%+N%,y%:PLOT21,f11%,
y%
 1180ENDPROC
 1190IFERR=17:VDU4:G=1:CLOSE£0:GOSUB190:
ELSEIFERR=&D6THENPROCsa:ELSEIFERR=&DETHE
NPRINT"File not found":PROCn:ELSEREPORT:
PROCn
 1200A$=" ":GOTO80
 1210*T.
 1220FORD%=0TOTOP-PAGE STEP4:D%!&E00=D%!
PAGE:NEXT:?&13=?&13-(PAGE-&E00)DIV256:R%
=&E00:PAGE=&E00:RUN
 2000REM PUT DUMP HERE
 2010RETURN
```

Checksum listing – see 'Checking Easyplot' for how to use it

Line	Checksum
1	1136
10	1651
20	1818
30	2060
40	1739
50	96
60	8843
70	3938
80	4731
90	3350
100	1965
110	7221
120	3137
130	5658
140	4583
150	4832
160	3461
170	3180
180	1913
190	10857
200	2458
210	7320
220	253
230	2196
240	5860
250	5867
260	11896
270	3415
280	5453
290	11979
300	882
310	4329
320	3217
330	1235
340	3942
350	8047
360	1776
370	7787
380	12938
390	3940
400	253
410	6210
420	4629
430	5912
440	2509
450	4802
460	9443
470	5354
480	5230
490	13940
500	879
510	5638
520	3082
530	1258
540	1261
550	2734
560	4561
570	2048
580	5346
590	230
600	1219
610	1783
620	1310
630	1266
640	1202
650	1207
660	4829
670	2051
680	1994
690	1937
700	9566
710	4104
720	2667
730	1207
740	2653
750	916
760	2768
770	295
780	990
790	992
800	994
810	230
820	3238
830	3068
840	5984
850	4384
860	230
870	4372
880	1961
890	2276
900	3438
910	1901
920	1044
930	1045
940	2547
950	1819
960	5225
970	230
980	9278
990	3836
1000	3213
1010	3188
1020	6155
1030	2939
1040	10267
1050	1567
1060	8041
1070	8250
1080	4337
1090	3036
1100	9139
1110	4402
1120	1080
1130	3035
1140	8290
1150	6594
1160	230
1170	9005
1180	230
1190	7569
1200	918
1210	179
1220	5010
2000	1210
2010	253

Checking Easyplot

MARTIN Phillips describes how you should enter and save the two Easyplot listings on page 81.

First type in listing 1 and save it to tape or disc using the filename "PLOT", ie:

SAVE "PLOT"

Next enter listing 2. Notice that this is very compact as memory space is at a premium. Note also that each program line in listing 2 is typed directly after the line number – this is important as it saves a considerable amount of memory. If you use AUTO to number lines, a space will be shown but will not be entered in your program. Save this program to disc or to tape; in the latter case it should be saved directly after PLOT. Use the filename PLOT2:

SAVE "PLOT2"

Rewind the tape if need be and CHAIN the first program using:

CHAIN "PLOT"

this will run and then chain in PLOT2.

If there are any errors in PLOT these should be reasonably easy to spot. PLOT2 is a different matter however!

The checksum listing has been generated for PLOT2 by the Summer program presented in First Byte (page 45). If you have not already done so, enter this listing and check the program as described in First Byte. With PLOT2 loaded, run the Summer program to generate the checksum for each line. If the checksum for any line differs make a note of it and examine it at the end. Correct any errors in the line and re-run Summer to re-check your listing.

The August listings cassette contains some example screens as illustrated in Martin Phillips' article.

See 'Help is at Hand', page 86

How to enter the program

TO ENTER this month's instalment you'll need the source code you compiled from the June and July issues of *Acorn User* and copies of those magazines for reference.

Enter and run the first program presented on page 102 of the June issue to set up the function keys with the main assembler mnemonics, thereby reducing the amount of typing you'll need to do. Place the function key strip (page 103, June) above the keys. Enter the listing on page 110 using the line numbers shown. Now save what you have entered.

To allow you to generate a checksum from the listing some dummy variables must be defined. So add the following lines to your program:

```
   10 REM Sideways RAM Utilities #3
   20 REM by Richard Harris
   30 REM for BBC B, B+
   40 REM (c) Acorn User August 1985
   50 :
   60 X%=&5000:Y%=&70
   70 recog=X%:temp=Y%:co9=X%
   80 message=X%:push=X%:onoff=Y%
   90 onoff1=Y%:prout=X%:table=X%
  100 trap=X%:pull=X%:stop=X%
  110 end=X%:prname=X%:data2=X%
  120 error=X%:error1=X%:table2=X%
  130 basic=Y%
  140 FOR pass=0 TO 3 STEP 3
  150 P%=&5000
  160 [OPT pass
  17000 ]NEXT
  17010 A%=0
  17020 FOR N%=&5000 TO &5200
  17030 A%=A%+?N%
  17040 NEXT
  17050 IF A%=56367 PRINT"Checksum Correct!
  ":END
  17060 PRINT"ERROR - Recheck listing":VDU7
```

Now RUN the program. After a short delay the assembly listing will appear, and then the program will check itself and let you know if it is correct or not!

Once the checksum is reported as correct, delete the dummy lines thus:

```
DEL.10,160
DEL.17000,17060
```

The next stage is to combine the current listing with parts 1 and 2, using *SPOOL and *EXEC as follows. Save the current listing thus:

```
*SPOOL PART3
LIST
*SPOOL
```

Now load in the last two months' listings which were combined in the July issue. Before doing this disc users should set PAGE to &1400:

```
PAGE=&1400
NEW
```

Once the combined parts 1 and 2 are loaded you can *EXEC part 3 in thus:

```
*EXEC PART3
```

Once the program has been read in, list it to ensure that it all looks correct. Now save the entire listing using

```
SAVE"RAM123"
```

or similar.

To save the object code first RUN the program to assemble the machine code in sideways RAM, and then use the second program presented on page 102 of the June issue to save it, following the instructions given in that issue.

Tired typists and UserRAM users will be pleased to note that the entire object code for the RAM utilities is available on the August listings cassette!

Acorn User in sideways RAM

THERE is no reason why you should not put your own favourite machine code routines from *Acorn User* in sideways RAM. In fact we hope to include some updates on how to do this in a forthcoming issue of *Acorn User*.

One command you might like to include in a ROM is the circle drawing routine given in the March issue (pages 81-83), which could be called by *CIRCLE X,Y,R. The guide above will give most of the information needed but a few changes to the program will be required. The main change is how to read X,Y and R. In the original this was done through a parameter block set up by the Basic CALL statement. You can try various ways with *CIRCLE – first the exact values could be entered with the command, eg, *CIRCLE 100,500,50. These could be read using a routine similar to 'getch', but this has a major disadvantage of not allowing the use of variables, although it could be used from ROMs other than Basic. The coding could be expanded still further to recognise A%, B% etc. These have fixed locations within Basic's memory map from &400 and would be easy to read. An even simpler way would be to always use A%, B% and C% and to set these variables before using *CIRCLE. The values could then be easily read from &406/7 (A%), &40A/B (B%) and &40E/F (C%).

I hope this series and the accompanying software has given a guide to the use of sideways RAM and ROMs. Programming your own is fun, not too difficult, and can have very useful results. Really good software might even be saleable!

```
 1100 BEQ hell
 1105 JMP hrom
 1110 .hell JSR &FFE7
 1830 .co6 LDX #8
 1840 JSR recog
 1850 BNE co10
 1860 JMP ron
 1870 .co10 LDY temp
 1880 LDX #12
 1890 JSR recog
 1900 BNE co7
 1910 JMP roff
 1920 .co7 LDY temp
 1930 LDX #17
 1940 JSR recog
 1950 BNE co8
 1960 JMP bon
 1970 .co8 LDY temp
 1980 LDX #21
 1990 JSR recog
 2000 BNE co9
 2010 JMP boff
13850 .hrom
13860 LDX #0
13870 JSR recog
13880 BEQ hr14
```

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```
13890 JMP hcom
13900 .hr14 LDX #8
13910 LDY #25
13920 JSR message
13930 JSR push
13940 LDA onoff
13950 STA &70
13960 LDA onoff1
13970 STA &71
13980 LDX #0
13990 LDY #&FF
14000 LDA #&FC
14010 JSR &FFF4
14020 STX &72
14030 LDA #&F
14040 STA &73
14050 .hr0 JSR colour
14060 LDA &73
14070 JSR prout
14080 LDA #&20
14090 JSR &FFEE
14100 LDA table,Y
14110 BNE hr3
14120 LDA #&D
14130 JSR &FFEE
14140 LDA #130
14150 JSR &FFEE
14160 LDY #17
14170 LDX #59
14180 JSR message
14190 JMP next
14200 .hr3 LDA #9
14210 STA &F6
14220 LDA #&80
14230 STA &F7
14240 .hr4 LDY &73
14250 JSR &FFB9
14260 CMP #0
14270 BEQ hr5
14280 JSR &FFEE
14290 INC &F6
14300 BNE hr4
14310 .hr5 LDA #134
14320 JSR &FFF4
14330 CPX #23
14340 BCC hr6
14350 JSR &FFE7
14360 JSR colour
14370 .hr6 LDY #2
14380 LDX #57
14390 JSR message
14400 LDY #0
14410 STY &F6
14420 LDY &73
14430 JSR &FFB9
14440 LDX #&59
14450 CMP #&4C
14460 BEQ hr7
14470 LDY &73
14480 LDA table,Y
14490 AND #&40
14500 STA temp
14510 BNE hr7
14520 LDX #&4E
14530 .hr7 TXA
14540 JSR &FFEE
14550 CPX #&4E
14560 BNE hr11
14570 LDX #76
14580 LDY #6
14590 BNE hr8
14600 .hr11 LDY #6
14610 LDX #33
14620 LDA temp
14630 BNE hr8
14640 LDX #39
14650 .hr8 JSR message
14660 LDY &73
14670 LDA (&70),Y
14680 LDY #6
14690 LDX #45
14700 CMP #0
14710 BNE hr9
14720 LDX #51
14730 .hr9 JSR message
14740 .next DEC &73
14750 BMI hr10
14760 JMP hr0
14770 .hr10 LDX #82
14780 LDY #25
14790 JSR message
14800 LDX #107
14810 LDY #7
14820 LDA trap
14830 BNE hr12
14840 LDX #114
14850 INY
14860 .hr12 JSR message
14870 JSR &FFE7
14880 JSR pull
14890 JMP stop
14900 :
14910 .hcom
14920 LDX #4
14930 JSR recog
14940 BEQ hc1
14950 JMP end
14960 .hc1 JSR &FFE7
14970 JSR prname
14980 LDX #8
14990 LDY #96
15000 LDA #&D
15010 .hc3 CMP #&D
15020 BNE hc4
15030 STY temp
15040 LDY #4
15050 LDA #&20
15060 .hc5 JSR &FFEE
15070 DEY
15080 BPL hc5
15090 LDY temp
15100 .hc4 LDA data2,X
15110 BNE hc2
15120 LDA #&D
15130 .hc2 JSR &FFE3
15140 INX
15150 DEY
15160 BNE hc3
15170 JSR &FFE7
15180 JSR &FFE7
15190 JMP stop
15200 :
15210 .colour
15220 LDA #131
15230 LDY &73
15240 CPY &72
15250 BNE hr1
15260 LDA #129
15270 .hr1 JSR &FFEE
15280 RTS
15290 :
15300 .ron
15310 LDX #1
15320 STX temp
15330 BNE ro1
15340 :
15350 .roff
15360 LDX #0
15365 STX temp
15370 .ro1 CMP #&D
15380 BNE ro2
15390 JMP error
15400 .ro2 INY
15410 LDA (&F2),Y
15420 CMP #&20
15430 BEQ ro2
15440 CMP #&D
15450 BNE ro10
15460 JMP error
15470 .ro10 CMP #&3A
15480 BCC ro4
15490 SEC
15500 SBC #7
15510 .ro4 SEC
15520 SBC #&30
15530 CMP #&10
15540 BCC ro5
15550 JMP error
15560 .ro5 TAY
15570 LDA table,Y
15580 BNE ro11
15590 JMP error1
15600 .ro11 LDX temp
15610 BNE ro6
15620 TXA
15630 .ro6 PHA
15640 JSR  push
15650 LDA onoff
15660 STA &70
15670 LDA onoff1
15680 STA &71
15690 PLA
15700 STA (&70),Y
15710 STA table2,Y
15720 CPY basic
15730 BNE ro7
15740 TYA
15750 TAX
15760 LDY #0
15770 LDA temp
15780 BNE ro8
15790 LDX #&FF
15800 .ro8 LDA #&BB
15810 JSR &FFF4
15820 .ro7 JSR pull
15830 JMP stop
15840 :
15850 .bon
15860 LDA #1
15870 STA trap
15880 JSR push
15890 LDA onoff
15900 STA &70
15910 LDA onoff1
15920 STA &71
15930 LDY #&F
15940 .bon1 LDA (&70),Y
15950 STA table2,Y
15960 DEY
15970 BNE bon1
15980 JSR pull
15990 JMP stop
16000 :
16010 .boff
16020 LDA #0
16030 STA trap
16040 JMP stop
```

*How to catalogue a disc on *>, page 117*

10 20

1

30

2

3

70

4

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110

6

140

7

8

9

Routine for checking data statements with the Acorn speech system, page 117

1 1010
2
3
4
5 1020
6
7 1030 1040
8 1050 1060
9 1070
10
11 1080
12
13 1090
14
15 1100
16 1110
17 1120
18

BAR CODE OFFER



KEEP UP WITH THE KIDS IN SCHOOL

BAR CODES will revolutionise the way we use computers in applications as well as the way we load data. Here is the chance to get experience of this important development by ordering the Addison Wesley/MEP Bar Code Teaching Pack (see our January issue, page 129) direct through *Acorn User*.

These BBC micro bar code readers are being offered to schools first and versions will not be available to the public in the shops until later in the year – when they will certainly cost more. However, because of its active involvement in the scheme *Acorn User* is able to offer the Teaching Packs direct to readers at the introductory price of £49.95 plus £2.95 post and packing (plus VAT).

Acorn User will be printing some listings in bar code format in each issue and making booklets of bar codes available by mail order.

Book publishers are already printing listings in bar code format, in fact Bruce Smith's latest book *The BBC Micro Machine Code Portfolio* has 13 pages of bar code listings.

So, to stay ahead of the latest development in computers and education, send off for a pack from *Acorn User* today. *See page 110 for offer of magazine listings in bar code format.*

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★software to print bar codes
★music program by Joe Telford
★bar code stencil
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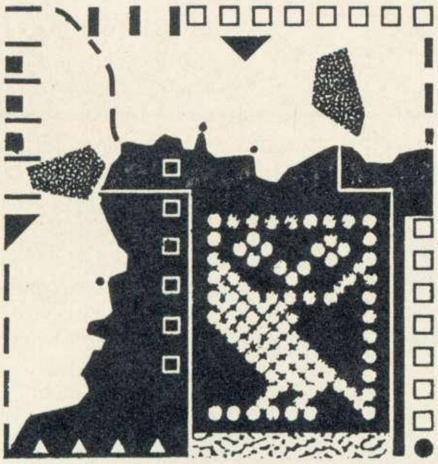
.... Post code ....

I enclose a cheque/PO payable to Redwood Publishing for £.........

Signed ....

Date ....

Send this form with your remittance to Bar Code Offer, Redwood Publishing, 68 Long Acre, London WC2E 9JH.



Bruce Smith passes on some more of your routines – for checking data statements, cataloguing discs and underlining *Wordwise*

£5 Getting the CAT out of the bag

THEY say the best ideas are the simplest ones, and the submission from Stephen Kilbane of Lutterworth, Leics, is certainly that. An idea for disc users everywhere: how many times have you come to get a catalogue of your disc not realising that you have accidentally set SHIFT-LOCK during the course of your typing? Instead of

```
*.
```

you get

```
*>
```

Stephen's solution is very simple. Save a machine code program on disc called '>' that will do a cat for you! The program is shown in listing 1. Simply type it in and save it with the command:

```
*SAVE > C00 C1E C00
```

Typing *>, either deliberately or in error, will run the program.

```
1 REM *> Program
2 REM Stephen Kilbane
3 :
10 P%=&C00
20 [OPT 3
30 STA &8B
40 STX &8C
50 STY &8D
60 LDA #&2E
70 STA &8E
80 LDA #13
90 STA &8F
100 LDA #0
110 LDX #&8E
120 LDY #0
130 JSR &FFF7
140 LDA &8B
150 LDX &8C
160 LDY &8D
170 RTS ]
```

Listing 1

£5 Talking data check

TREVOR Buck, of East Goscote, Leics, has come up with an interesting routine for owners with the Acorn speech system, for use with checking DATA statements. Simply enter your DATA and at the end call Trev's short routine (listing 2). It will read them back to you as you check them through.

```
970 REM Checking data stateme
nts
980 REM For BBC with Speech S
ystem
990 REM Trev Buck 1985
1000 REM Sample data list
1010 DATA 435,783,184,2335,649
,889,130,555,362,789,132,1004,2
3,0,867,0.113,-6
1020 REM Rogue value to finish
1030 DATA ]
1040 end=FALSE
1050 REPEAT
1060 READ num$
1070 IF num$="]" THEN end=TRUE
1080 FOR sound=1 TO LEN (num$)
1090 SOUND-1,ASC(MID$(num$,sou
nd,1)),0,0
1100 NEXT sound
1110 SOUND-1,ASC(" "),0,0
1120 UNTIL end=TRUE
```

Listing 2

Bruce looks forward to meeting Beeb Forum fans at the Acorn User Show from July 25 to 28.

£5 Mouse dump

AMX Mouse users who are having trouble producing printer dumps on certain printers might find Simon Williams' short program (listing 3) of use. Simon says, 'If you want to produce a print-out on a printer other than an Epson you are required to store a routine on your work disc labelled "XDUMP", which will load at &5000 – this must be no longer than &800 bytes in length. If you have a printer dump ROM such as Printmaster or Dumpout 3, all you really need to do is to issue the appropriate command to this ROM, eg, to do this for the Dumpout 3, the machine code program would suffice.'

```
1 REM AMX oscli routine
2 REM by Simon Williams
3 :
10 FOR PASS = 1 TO 3 STEP 2
20 P%=&5000
30 [OPT PASS
40 LDX#dump MOD 256
50 LDY#dump DIV 256
60 JSR&FFF7
70 RTS
80 .dump EQUS"GIMAGE NEC X 28
1056 Y 192 928 I ("+CHR$(13)
90 ]
100 NEXT PASS
```

Listing 3

£5 Drawing the line

MR JONES of Gloucester supplies this month's *Wordwise* fix. His function key definition will allow you to centre and underline text (for Epson or compatible printers) without the underline starting from the left margin, for example,

<u>UNDERLINED TEXT</u>

Here is the way to achieve this:

```
*KEY0 ‖!!CE‖!"‖ ‖!!0C27,45,1‖!"
```

On pressing SHIFT-CTRL f0 and adding some text this will be displayed in edit mode as

```
CE    0C27,45,1 ENTER TEXT HERE
```

Don't forget, on starting the next line, to enter the code to turn off the underline.

£5 Mouthwatering morsel

TO MAKE your mouth water in anticipation of next month's wordprocessor hints and tips pages, here's a taster from George Reilly of Dublin. George writes . . .

The function keys can be used to insert text into *View* using CTRL + SHIFT + fn. Simply define the keys as normal and then issue a *FX228,1.

Then press the key combination to insert the text in edit mode. In *View* the function keys produce the following codes when pressed:

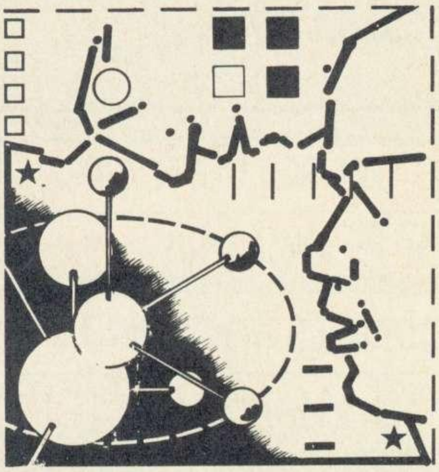
f0 to f9	:	140–149 (&8C–&95)
SHIFT + fn	:	156–165 (&9C–&A5)
CTRL + fn	:	172–181 (&AC–&B5)

These codes can be used to good effect. To move the cursor to the end of the previous line define key fn as:

*KEY n ! [! Q

where ! [will move the cursor up one line (code &9B) and ! Q (code &91) will move to the end of the line. Use this in edit mode with CTRL – SHIFT – fn.

In addition the Copy and cursor keys can be set up as function keys with *FX4,2.



Mike Barwise reveals how you can reduce loading on the system bus, and rewards a reader for pinpointing an assembler bug

Upgrade well with Rockwell

ANDREW LUCK of RAF Coningsby, Lincoln, has written to me to say that he has tried to upgrade his Atom by fitting a Rockwell 65C02 processor. The Atom has refused to operate reliably, and he suspects the processor chip is faulty. Two replacements have exhibited the same faults.

Andrew (and the rest of you wanting this upgrade) will be pleased to hear that this is not a fault in the processor: the Rockwell 65C02 is alive and well and living in lots of systems.

The problem lies in the unfortunate combination of the design of the Atom and the difference in the characteristics of the NMOS (old 6502) and CMOS (65C02) technologies.

To be logical and deal with the second point first, CMOS uses much less power than NMOS or bipolar technology because it has a much higher input impedance: it draws less current. In fact, it draws practically no current at all at any given node (eg, an input pin connection) unless the node is actually changing state. One could say that its performance is analogous to AC as opposed to DC coupling (NMOS, bipolar) in audio and radio terms, which suggests that each node acts like a very small capacitor. The disadvantage of this characteristic is that the device is much more sensitive to excess capacitative loading on the system bus. An overloaded line will exhibit a slow signal rise time. A sufficiently slow transition will either fail to register as a transition at all (due to the AC coupling characteristic) or at worst actually destroy the junction concerned. A very interesting article published in *New Electronics* (April '85) lists voltage rise time as a major cause of CMOS latchup (temporary malfunction), dielectric breakdown and source-drain punch through (both methods of destroying the 'transistors' in the device).

Now to the Atom: a 12k 'maximum' Atom has just about as many chips loading the bus as the NMOS processor will handle. Some unlucky owners have had failures even with NMOS processors, because the parameters of all microchips are slightly variable, and they have a set of chips with worst case loading characteristics. Put in any CMOS device, and you can pretty well guarantee that the bus performance will be inadequate for it. Although the 65C02 has certainly been equipped with internal buffering to provide drive compatibility with 6502, it will almost inevitably have retained some of its CMOS signal rise time sensitivity, bearing in mind that the 12k Atom may be running on worst case 'just acceptable' parameters even for NMOS.

The answer is to reduce the loading on the bus. The first and most significant improvement is to strip off all those rather ancient sledgehammer memories. Each 2114 contributes a loading about equivalent to a modern 8k × 8 CMOS or MixMOS memory. Multiply that by 10 (for the real 'lower text space' RAM) and the problem is obvious. Any piggyback contraptions will also contribute to the overloading, so they should be used with discretion.

The proper approach is to position this memory (even using 2114s) beyond the bus buffer set. The loading of the one set of buffers will then be substituted for the total memory chip loading. Incidentally, the bus data buffer can be enabled for other areas of the address map as well, allowing a lot of expansion without further loading the processor.

Practical considerations involved in producing a bus extension are a little more complex, as there are the hidden problems of timing delays in the physical wiring and of spurious noise induced by the outside world and adjacent signal lines in cables and PCBs.

The Atom Disc Pack approach (a 64-way cable between the controller card in the disc drive case and the bus connector) ignores these considerations, and just about works, provided the cable is no longer than about 8in, and that the controller is the sole peripheral on the cable. The addition of a RAM card, for example, can increase the system failure rate.

The electronics enthusiast might like to investigate the matter, but should take note of the complexity of the problem. The job has been done already by Bear Hardware, who supply a home constructor's design manual (£10.35) for a bus extender using a 1 metre 40-way ribbon cable.

£10 A is for accumulator

FULL marks for enthusiasm (and a tenner) to Mr R Lambert of Kelvedon, Essex. He sent me a letter in answer to my question about the Atom assembler bug (May issue) and said:

I do quite a bit of assembler programming and I found this bug very early on, but your article prompted me to find out what happens.

In the assembler interpreter at about F3F2, hex, the assembler looks at the mnemonic data/address information and compares the first character to @, (, and A. If a match is found for A (which will happen for accumulator directives or if the label AA(x) is used) then the program jumps to F49B, which is the interpreter for accumulator commands.

The first part of the F49B subroutine checks if this is a valid accumulator command. If it is not, then a BRK is executed and so on to the error handler.

I have checked Mr Lambert's information, and it is absolutely right. The



The mighty Atom with disc drive

Atom manual is in fact incorrect on this point, and this conclusively proves that the symbol 'A' should only be used as an accumulator directive in Atom assembler. Mr Lambert's letter is the first step in the right direction: I want to both answer and ask questions. Your questions will get answered where possible, and your answers to my questions will elicit minor emoluments.

Another printer problem solved

FURTHER to my comments on the connection of eight-bit printers to the Atom (April '85), several readers have asked whether there is a way round having to relinquish their graphics printing modes by permanently wiring the bit 7 low. I have received a few (fairly similar) suggestions concerning the connection of printer bit 7 to a spare line on one of the Atom peripheral ports (the 8255 or 6522), but these demand a software overhead to keep switching the level of the port, and can also restrict the use of the eight-bit printing mode with other facilities which modify the port data.

I have come up with an answer which seems to be the simplest idea on earth. It is entirely hardware, is totally transparent, and requires no irrevocable modifications to the Atom board. The circuit (figure 1) consists of three part-used TTL chips.

Data bit 7 of the VIA port used for the printer is programmed as an input, and used to monitor the busy status of the printer. All the other data bits are programmed as outputs.

During a write cycle, the data bus presents an eight-bit byte to the VIA, but the level of bit 7 is ignored, as a VIA bit programmed as an input looks like a high impedance to a write. Thus seven of the eight bits of data are transferred to the VIA output port.

If data line 7 is split off before the VIA and coupled to the printer connector bit 7 pin, the signal blocked by the VIA will arrive at its destination. However, the line must be rendered an output-only signal path, to prevent a read operation on the VIA attempting to integrate the two possible sources of data bit 7. It must also be held stable after a write until the printer has had time to read its level. A 'D' type transparent latch (74LS75) accomplishes this. The latch output is fed to a non-inverting buffer (74LS126) with the same current drive capacity as the printer buffer (74LS244) to provide a signal compatible with the rest of the printer interface.

So far, we have rendered bit 7 bi-

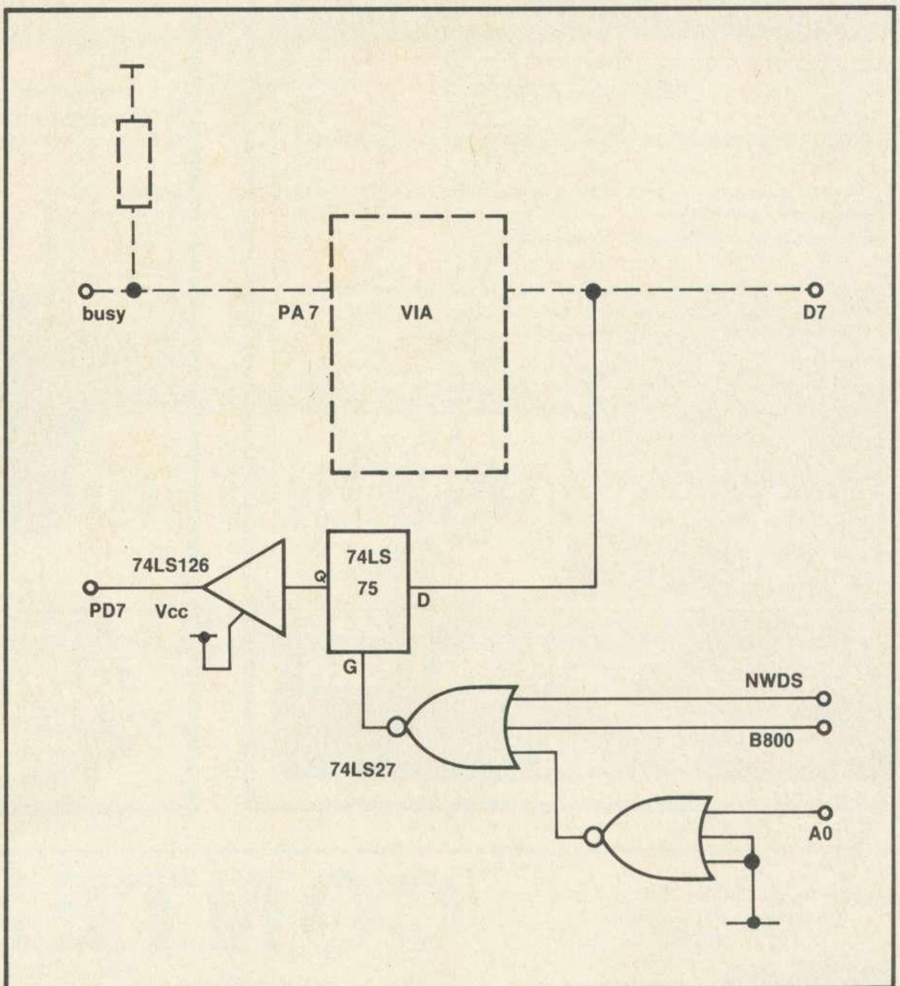


Figure 1. Hardware to connect an eight-bit printer without surrendering graphics printing modes

directional, while all other data bits are outputs only. However, we do not want every write operation to send data bit 7 to the printer port. This might corrupt data in the printer's internal buffer at worst, and in any case it's messy. The latch gate is decoded to trap data bit 7 only when the printer port register of the VIA is addressed.

The three input NOR gates (74LS27) accomplish this by enabling the buffer only during NWDS AND NOT CS while A0 is high. This equates to #B801 plus write plus phase 2.

The three chips may be wired up on a piece of veroboard and mounted somewhere fairly close to the VIA. The board should finish up no more than about 1.5in square, and flying leads may be taken from it to suitable points on the Atom board to pick up the relevant signals. The simple approach is to scrape the resist away on a track where it is clear of obstacles, and tack the flying lead down with solder. The enthusiast might like to trace the positions of accessible plated through holes in the relevant tracks and solder in wire-wrapping pins. Any accurate maps of suitable holes are candidates for this column and some lolly.

£10 Recording an apology

OOPS! Sorry! My article in the July issue on cassette machines was not quite accurate.

Since then Richard Cripps, an electronics technician at the Department of Metallurgy, Oxford University, has pointed out that the primary cause of differential level of the two tones is incorrect head alignment.

The auto level control must be faulty before it contributes appreciably to the problem. He proved this to me while I was in Oxford recently, so apologies all round.

Note that you may not know you have misaligned heads, as tapes made on an offending machine will frequently replay on the same machine without much trouble.

The good news is that this fault can be corrected.

See *Acorn User* March '84, page 57 for an adequate, if empirical, solution, or pass your recorder to a mate with a 'scope.

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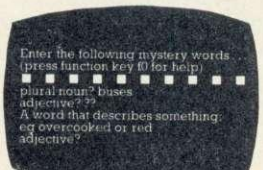


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Access

Mouse alarmed

AMX Mouse owners can now get desktop organiser software which turns the BBC micro into a passable imitation of the Apple Macintosh. *AMX Desk* costs £24.95 and offers a memo pad, telephone address book, diary, alarm and calculator.

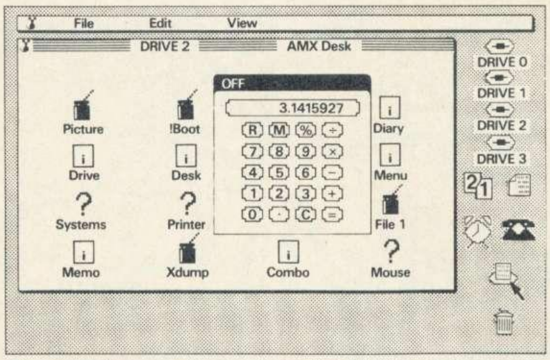
These functions are accessed by menus which are 'pulled down' from the top of the screen by a cursor and symbols or 'icons'. So to delete a file, for example, the mouse is used to position the cursor over the dustbin icon.

The Memo Pad can hold up to three pages of text with printing at the touch of a button. The telephone/address book can store up to 200 entries (400 on a double density disc).

The Diary features a three-month calendar and simple calculator, results from which can be used in other functions. The alarm clock keeps time no matter which other Desk function is in use.

Art Utilities beefs up the standard drawing software which comes with the mouse. At £14.95, it provides a zoom feature, and routines for drawing ellipses and arcs.

Advanced Memory Systems supplies these programs on disc and can be contacted on (0925) 62907.



Simulated screen display from the AMX Desk package



BUFFERBOX receives and stores electronic mail while your BBC micro isn't plugged in. The unit costs £450 and connects via an auto-answer modem to the public telephone network. Details from Telepost on (0753) 882028.

Modem boost

OVER 200 CP/M titles are available free of charge to members of the CP/M User Group, apart from a copying charge of £1.50 per disc. You have to supply your own blank discs.

The UKM 7 communications package covered in this month's issue by Ed Brown's article is available from the CP/M User Group. Membership costs £7.50 for individuals at 72 Mill Rd, Hawley, Dartford, Kent DA2 7RZ (enclose sae).

Gemini trio can swap data files

TRIPLE-D is the latest in a long line of business software from Gemini Marketing. It consists of a database management system, a spreadsheet and a graphics program, and the complete set of discs costs £69.95.

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The spreadsheet is truly disc-based and can handle up to 2000 rows and a massive 52,000 cells. It also has Macintosh-style pop-down menus.

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Powerful

Gemini's boss, Dale Hubbard said: 'It's our most important product ever. The success of our ROM database, Datagem, has shown there's a market for serious software and the Triple-D programs are the most powerful and sophisticated of their breed.'

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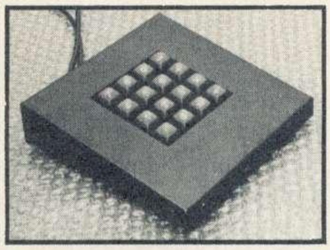
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2	Wordwise +	Computer Concepts	—	—	£56.35	—	—	Yes (£4.95)
3	View	Acornsoft	—	—	£59.80	—	—	—
4	Database	Acornsoft	£11.90	£15.35	—	—	—	—
5	Wordwise	Computer Concepts	—	—	£46.00	—	—	—
6	Integrated Accounting Suite (5 in series)	Gemini	—	£99.95 each	—	—	*	—
7	Masterfile 2	Beebugsoft	—	£19.00	—	—	Yes	Yes
8	Printmaster	Computer Concepts	—	—	£33.35	—	*	(Yes)*
9	Viewsheet	Acornsoft	—	—	£59.50	—	—	—
10	Discmaster	Beebugsoft	—	£19.00	—	—	Yes	Yes

Compiled by RAM/C from a panel of specialist dealers
*Contact publisher: Database, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY 061-480 0171; Computer Concepts, Gaddesden Place, Hemel Hempstead, Herts HP2 6EX (0442) 63933; Acornsoft, 645 Newmarket Road, Cambridge CB5 8PD (0223) 214411; Gemini, Gemini House, Concorde Road, Dinan Way Industrial Estate, Exmouth, Devon EX8 4RS (0395) 265165; Beebugsoft, PO Box 50, St Albans, Herts (0494) 815228.
†3in disc

Key to industry

DATAPAD has 16 keys and works with the BBC micro to aid data entry in industrial environments. The unit costs £39.95 and is claimed to work with most commercial programs, including *Wordwise* and *Viewsheet*. Details from Voltmace on (0462) 894410.



Further reading on communications

Data Transmission by M D Bacon and G M Bull (Macdonald & Co).
ISBN: 0 35604387 8.
An introductory text for data communications that is much used in academic spheres.

Handbook of Data Communications (NCC Publications).
ISBN: 0 85012 121 3.
As its title suggests, a handbook that explains data communications from the concepts through to the international standards. Contains useful glossary and bibliography.

Networking with the BBC Microcomputer by R G Napier (Prentice Hall).
ISBN: 0 13 611468 7.
An introductory text to Econet on the BBC micro, it explains the concept of a network and how to use Econet, but does not include a section on how to use Econet from the second processors.

Computer Networks by Andrew S Tanenbaum (Prentice Hall).
ISBN: 0 13 165183 8.
Describes the layers of the ISO network model and describes networks in operation. Only for the enthusiast.

Computer Communication Networks by Norman Abramson, Franklin F Kuo (Prentice Hall).
ISBN: 0 13 165431 4.
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AU8/6

CHATTING WITH CP/M

CP/M machines communicate too. Edward Brown tells of two ways

COMMUNICATIONS – or comms, as it is colloquially called – is often a mystery subject that seems incomprehensively complicated. Rather than deal with the intricacies of communications here – the Further Reading box on page 121 can be consulted for general coverage of the subject – I'll show you two methods of communicating between CP/M machines, one using PIP (Peripheral Interchange Program) and the other using the public domain program *UKM7*.

PIP is a command program that is loaded in from Acorn's CP/M utility disc. It allows you to copy files or a series of files from one peripheral to another. The most obvious way of using PIP is to copy a file or a series of files from one disc to another, but PIP can also be used to copy a file from, say, a disc to a printer.

UKM7 is available in its original form on volume 10 of the UK library of the CP/M Users Group (UK) and on other volumes in a form suitable for different machines. For details of the CP/M Users Group (UK) and the library of public domain software see last month's issue.

In addition to the public domain program *UKM7* several packages for communications are commercially available, including *BSTAM* from Byrom Software, *Crosstalk* from Microstuff, and Derwent Data Systems' *Chit-Chat*. All three are available from Acornsoft.

Before describing the two methods of communication I'll outline some of the fundamentals of data communications (see glossary box for frequently used terms).

To communicate between machines we need to link the two machines together in some way. Such a direct connection must be constructed so that the data out from one machine is linked to the data in on the other. This can be compared with the way a telephone crosses over what is spoken in the mouthpiece of one to what is heard in the earpiece of another.

This link with data in and data out crossing is the simplest connection between two machines. It allows data to be sent between machines, but what is sent over this link must be controlled in some way, otherwise data may be sent when the receiving machine is not ready to receive. This control is known as handshaking and can be performed by hardware or software.

The simplest form of software handshaking is the XON/XOFF protocol, by which the receiving machine sends an XOFF character (13H) when it is unable to receive any more data and then sends an XON character (11H) when it is able to receive again. The most commonly found method of hardware handshaking is the RTS/CTS link, which is provided on the BBC. With this link a Request To Send (RTS) to the receiver is answered by a Clear To Send (CTS) to the transmitter, after which the receiver can accept data.

When the machines are not close together connection is not as basic, the wire link being replaced by the tele-

Figure 2. Back-to-back connection

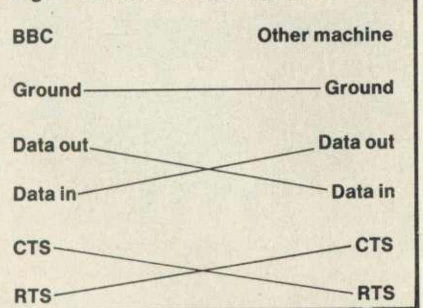


Figure 3. Modem connection

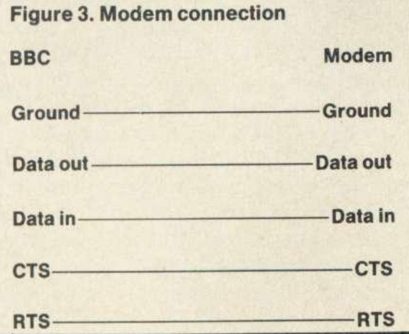
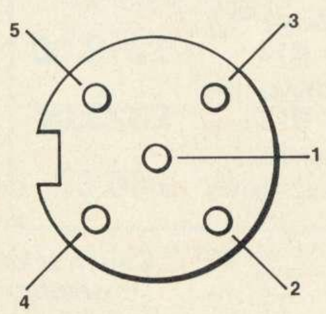


Table 1. Procedure for transferring files between two Beebs

Output BBC	Input BBC	Note
STAT PUN: = TTY:	STAT RDR: = TTY:	Set RDR and PUN to RS423
STAR 8,3	STAR 8,3	Set output speed to 300
STAR 7,3	STAR 7,3	Set input speed to 300
PIP PUN: = CON:	PIP CON: = RDR:	Test the link by typing

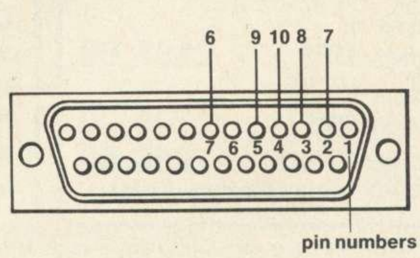
Figure 1. Pin assignment on connectors

BBC CONNECTOR (looking into socket)



1 Ground
2 Data out
3 Data in
4 Clear to send (CTS)
5 Request to send (RTS)

25-WAY D-TYPE CONNECTOR (as on other micros or peripheral)



6 Ground (pin 7)
7 Data out (pin 2)
8 Data in (pin 3)
9 Clear to send (CTS) (pin 5)
10 Request to send (RTS) (pin 4)

phone network. This introduces a problem, as the telephone network was designed for transmitting and receiving sound rather than data. The data therefore has to be translated into a form that can be carried via the telephone network. This transformation is called modulation and the reverse transformation to convert the telephone signal back to data is called demodulation.

There are many forms of modulation, each with its own advantages and drawbacks. Those interested in this area should consult the book *Data Transmission*. For our purposes it is sufficient to know that a modem takes care of this MOdulation and DEModulation for us.

Using PIP

To transfer data between machines using PIP you have to have a cable constructed as shown in figure 2. Transfer is carried out via the serial ports on both machines so you must ensure that both these are assigned using the STAT utility and that both are working at the same speed.

The procedure for transferring files between two BBCs is shown in table 1 (a similar sequence would be used for other machines). Using this sequence, anything typed on the keyboard of the output machine should be displayed on the screen of the input machine. Once this works you can transfer files by using PIP PUN: = filename on the output machine and PIP filename = RDR: on the input machine.

When using the PUN and RDR devices to transfer a file NUL (0H) characters are placed at the start of the file and these can easily be removed using *MemoPlan*. They are present because PUN and RDR were originally designed as paper tape input and output devices and therefore needed an inch or two of blank tape at the start of each file for loading purposes.

If a file transfer does not work for any reason check all your connections. If they are correct there are two probable causes of the problem.

The first is that there is no end-of-file marker at the end of the file you are transferring. You can specify an end-of-file by adding EOF to the end of the command line in PIP, making the command to transfer a file on the output machine PIP PUN: = filename,EOF. The second is caused by the file containing characters that cause problems during the transmission. Only ASCII files can be transferred using this method and this means that object files (those with a COM extension) cannot be transferred as some of the characters they contain will cause the transmission to fail. To transfer this sort of file you have to use a utility that changes the file from

Listing 1. Alterations to be made to UKM7. ASM for use with BBC + Z80

```
OSBYTE  EQU   OFFF4H         ;OSBYTE ENTRY POINT
MSNDB   EQU   2              ;MODEM SEND BIT (XMIT BUFF EMPTY)
MSNDR   EQU   2              ;MODEM SEND READY
MRCVB   EQU   1              ;MODEM RECEIVE BIT (DAV)
MRCVR   EQU   1              ;MODEM RECEIVE READY

        ORG   100H
        JMP   START

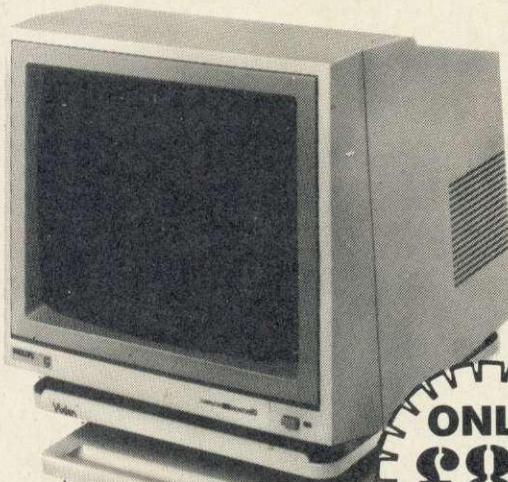
;THESE SYSTEM DEPENDENT ROUTINES ARE AT THE BEGINNING OF THE
;PROGRAM SO THEY CAN BE PATCHED WITH A MONITOR
FASTCLK:      DB  TRUE       ;4MHz or greater
BAKUPBYTE:    DB  TRUE       ;true=make .BAK file
XPRFLG:       DB  FALSE      ;true=menu initially off
SAVCCP:       DB  TRUE       ;true=do not overwrite CCP
SAVEFLG:      DB  TRUE       ;true=terminal filesave initially on
ECHOFLG:      DB  FALSE      ;true=terminal echo initially on
INITFLG:      DB  FALSE      ;true=modem port already initialised
ANSBAK:       DB  TRUE       ;true=answerback on ^E
;
INMODCTLP:    PUSH H
              LXI  H,08H     ;STATUS PORT IN SHEILA
              MVI  A,096H    ;READ FROM SHEILA
              CALL OSBYTE
              MOV  A,H
              POP  H
              RET
;
OUTCTLP:      PUSH PSW
              PUSH H
              MOV  L,A       ;CONTROL BYTE
              MVI  H,0
              MVI  A,09CH    ;UPDATE ACIA CONTROL REGISTER
              CALL OSBYTE
              POP  H
              POP  PSW
              RET
;
OUTMODDATP:   PUSH PSW
              PUSH H
              MVI  L,09H     ;TRANSMIT REGISTER
              MOV  H,A       ;CHARACTER TO OUTPUT
              MVI  A,097H    ;WRITE TO SHEILA
              CALL OSBYTE
              POP  H
              POP  PSW
              RET
;
ANISND:       ANI  MSNDB     ;bit to test for send ready
              RET
;
CPISND:       CPI  MSNDR     ;value of send bit when ready
              RET
;
INMODDATP:    PUSH H
              LXI  H,09H     ;RECEIVE REGISTER
              MVI  A,096H    ;READ FROM SHEILA
              CALL OSBYTE
              MOV  A,H
              POP  H
              RET
;
ANIRCV:       ANI  MRCVB     ;bit to test for receive ready
              RET
;
CPIRCV:       CPI  MRCVR     ;value of receive bit when ready
              RET
;
LOGMSSG:      DB 'YOUR MESSAGE HERE',CR,LF,0
;
; ROUTINE BELOW IS FOR THE BBC MICRO
;
INITMOD:      PUSH PSW
              PUSH H
              LXI  H,0H
              MVI  A,0E8H    ;MASK OUT IRQ BIT
              CALL OSBYTE
              POP  H
              POP  PSW
              LDA  INITFLG
              ORA  A
              RNZ            ;RETURN IF ALREADY INITIALISED
              MVI  A,03H
              CALL OUTCTLP   ;INTERNAL RESET
              MVI  A,056H
              CALL OUTCTLP   ;8 BITS NO PARITY
              LXI  H,5       ;3=300, 4=1200, 5=2400, 6=4800
              MVI  A,7       ;SET RECEIVE SPEED
              CALL OSBYTE
              LXI  H,5       ;3=300, 4 1200, 5=2400, 6=4800
              MVI  A,8       ;SET TRANSMIT SPEED
              CALL OSBYTE
              CALL INMODDATP
              CALL INMODDATP ;CLEAR BUFFERS
              RET
;
START:
```

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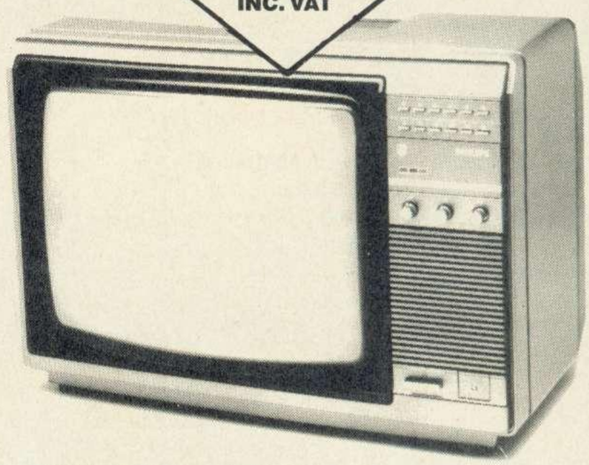
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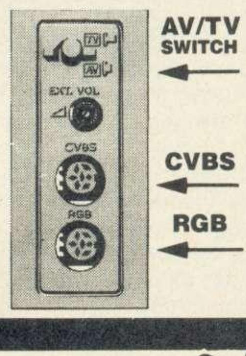


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an object form into an Intel hexadecimal form suitable for load. This file is then transferred using PIP and reloaded at the other end using LOAD.

Using UKM7

To communicate between machines using *UKM7* you need a cable made up as in figure 2. If the communication is to be through a modem the cable should be made up as shown in figure 3. Using *UKM7*, the data is transferred via the serial ports and these must be initialised correctly.

The main factor here is the speed of transmission. If you are working through a modem the speed will be dictated by the modem and this will normally be 300 baud. If you are working back-to-back, however, the speed can be anything that you determine, as long as both machines are set to the same speed. I have successfully transferred files using *UKM7* at speeds up to 4800 baud – speeds above this have been used, but not always successfully.

It is worth noting at this point that the speed of disc access affects the success of file transfer using *UKM7*. Why this is so remains a mystery to me, but at low baud rates there seems to be no problem while at higher rates the drive access time needs to be shortened. This is accomplished by altering the links on the front right of the keyboard. These links should have been set to match your drives when the disc interface was installed. If you are in any doubt about the settings then consult your dealer.

UKM7 provides you with the facility to use the BBC + Z80 as a terminal to another system and to transfer files, including COM files, between machines. The transfer of files is achieved using a protocol that protects the transmission against errors. This protocol has become a *de facto* standard among CP/M users and is called the Christensen protocol after the author of the original modem program.

UKM7 has two main uses: one is for transferring programs between machines with different disc formats and the other for accessing remote machines or bulletin boards. The Chiltern branch of the CP/M Users Group (UK) runs a bulletin board available to all CP/M Users Group members and *UKM7* is the program used to access this facility.

UKM7 needs to be installed for each machine that it is to run on and listing 1 shows the code to be included in the program to run on the BBC + Z80. The code given should replace the routines of the same name at the beginning of the *UKM7* program. When the code has been added the program should be assembled using ASM and changed into a COM file using LOAD.

There are a few points in particular that need noting about the alterations. The ORG 150H and ORG 180H statements of the original *UKM7* have been removed, because the code no longer fits into the space provided. The OSBYTE EQU 0FFF4H has been added and the modem equivalents MSNDB, MSNDR, MRCVB, and MRCVR have been altered. The block following the jump start has been modified for the BBC + Z80. When you are more experienced with *UKM7* you might want to alter some of these equivalents and re-assemble a new version. Only the routines ANISND, CPISND, ANIRCV, CPIRCV of the system-dependent routines do not change – all the others should be typed in as shown.

Glossary of comms terms

Acoustic Coupler A device for changing the data into a suitable form for transmission through a telephone. The telephone handset is placed in rubber cups to make the connection.
ASCII Code for representing characters.
Asynchronous transmission Most common method of data communication at home computer level. Each character has extra bits before and after it to signal the start and end of the character. Ten or 11 bits are commonly transmitted for each character.
Baud Rate of change in a communications channel. For most purposes it can be taken as bits per second (300 baud is approximately 30 characters per second). See also asynchronous transmission.
Carrier The signal upon which the data is modulated.
Checksum Value calculated from the data transmitted to assist in the detection of errors.
Demodulate Change a signal from analogue form (sound) back to a digital (data).
Full duplex Transmission in both directions at once.
Half duplex Transmission in both directions at different times.
Modem A device for changing the data into a suitable form for transmission through a telephone. Modem connects directly to the telephone line, unlike an acoustic coupler.
Modulate Change a signal from digital form (data) to analogue (sound).
Synchronous No extra bits are sent with the character because the transmitter and receiver are synchronised by separate signals.

CP/M CORNER

Tips by Edward Brown and Richard Clement

Volumes increase

THE CP/M Users Group (UK) has increased the number of library volumes by including the PC/BLUE library, which consists of more than 100 discs of IBM PC and compatible software. The Chiltern branch of the group is now operating a bulletin board, and details and a password can be obtained through the UK group or the Chiltern branch.

Chiltern is having an open meeting on Wednesday August 28, the subject of which will be using CP/M with the BBC micro. For details contact The Chairman, Chiltern Branch CP/M UG (UK), 12 The Chase, Marlow, Bucks SL7 1UU.

An Oxford branch is being started and those interested should contact Mrs Joyce Clarke, Epsilon Consultancy Ltd, Waylands Croft, Stonefield, Oxford.

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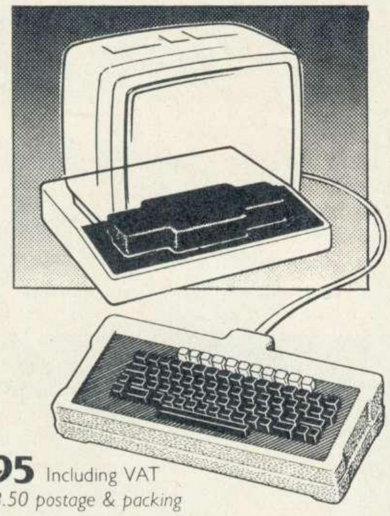
MANY readers have written requesting details of the book we are preparing, mentioned in the April issue. The company that was to publish the book ran into financial problems and at present is in negotiation with another publisher. We'll keep you posted.

If you're a CP/M user with problems, or have hints you'd like to pass on, then write to CP/M Corner, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

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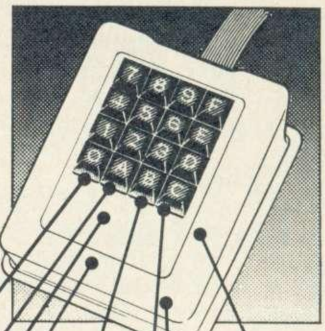
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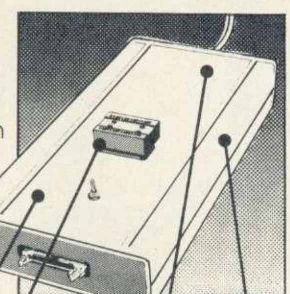
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Magazine database cuts search time

ONE of the most useful facilities to come my way is the McHugh Enterprises Magazine Bibliography. This database covers all topics relating to the BBC micro in issues of *Acorn User* and four other leading magazines since December 1981. It is upgraded monthly with a further 400 references and these may be searched on either a single-string or two-string basis.

To search the entire database from two double-sided 80-track discs (other formats available) takes about six minutes – not particularly fast, but McHugh makes no claims for speed, only for efficiency. The results are well worth waiting for – clearly ordered in a sensible format with title, date and page-number.

All this information doesn't come cheap but for any educationalist it saves so much time that it pays for itself rapidly. Information centres, education offices, resource libraries and the like would all greatly benefit from this facility.

The eight parts so far are available at £10 each, with a subscription rate of a further £10 per update.

The company also offers a service for combining parts onto single discs or altering formats when you buy new equipment.

McHugh Enterprises are at 43 Hookstone Oval, Harrogate, North Yorks HG2 8QE. Tel: (0423) 887742.

Dance with a micro

WE don't often feature information for teachers of dance but a company called Live Wire Consultancy is developing a fascinating combination of computer and synthesiser for use by groups in the dance class.

If you have ever noticed the little black boxes on the top of some traffic lights or built into security systems you will have realised that these are detectors of some sort. Imagine a range of detectors in your dance studio: ultra-sound, infra-red, laser beam, doppler shift – you name it, they use it – and all of these linked to the micro which, with some cunning software, interprets every movement detected on the floor space and translates it into sound via the synthesiser.

Yes, you've got it – the dancer is creating his or her own music by the rhythms and movements of the body. The uses of the system are limited only by the imagination, says Live Wire. Mime artists, theatre groups and disabled children may all find means of expression through this system.

The cost of a set of five sensors – three infra-red, one doppler and one ultra-sound – plus the software should be about £350. Savings can be made by replacing more expensive sensors with floor mats and also by eliminating the synthesiser and using the BBC's own sound system. Not only sound may be controlled by this system – disco lights go a bomb with it!

Live Wire Consultancy is at Coombe Fishacre, Newton Abbot, Devon TQ12 5UQ. Tel: (0803) 812836.

Update plea

SEVERAL companies point out that they were not included in our software database. Apologies for this – you will realise what a mammoth undertaking it was and the delay between creation and publication. If you want to feature in our next update, then send your catalogue to me at Education News.

Commentary by

Nick Evans,

who welcomes

reader feedback



Expense limits video projects

INTERACTIVE video has hit the headlines, especially with the advent of the Domesday Project. Work is being done in a variety of places, notably within MEP and at the National Interactive Video Centre, which aims to be a focal-point for all research and development in this specialist area.

At present only a limited number of 'active' discs are available (is *everyone* developing a database using the 'Birds' or 'Van Gogh' discs?). This is simply because of the vast cost of producing one interactive disc – somewhere in the region of £10,000! Any project wishing to undertake the development of a coherent piece of material must be pretty certain that it's got it right.

Here are some ideas from the Institut National de Recherche Pédagogique in Paris, notably from one of its researchers, Bernard Dubreuil. M. Dubreuil is concerned with developing packages based on original material and on existing discs.

Five ways of using the interactive video system have so far been developed:

- As an improvement on manual search facilities on the video disc player itself.
- As an information retrieval system based on specific discs of information.
- As a means for superimposing text on pictures and sound.
- As a dictating machine, transcribing the soundtrack with a wordprocessor.
- As a knowledge-based system.

Any system of interactive video makes certain specific demands upon those involved in its development. Moreover, the system itself needs to fulfil various requirements if it is to operate effectively. The advantages of video disc over video tape are much the same as those of computer disc over computer tape. Access times are quick and there is much more flexibility for random access (although experiments have been undertaken with interactive video tapes).

For a system to be effective for the user the speed of access should be rapid and editing should be easy – which implies that a mixture of high and low level language should be used as appropriate and that all data is accessible in digital form. Of course, because the video picture is not digital it may not be acted upon by the computer and so any integration of computer and video image must be done by superimposition.

For the *communications*

continued ▶

Education Top Ten

	Title	Publisher	Price	Micro
1	Music System	Island Logic	(£29.95)	B
2	Mr T (series)	Ebury	£9.95	B/E
3	Pan 'O' Level (series)	Hill McGibbon	£14.95 (£19.95)	B/E
4	Mathskill 1 and 2	Griffin	£11.95	B
5	Best Four – Language	ASK	£19.95	B/E
6	First Steps with Mr Men	Mirrorsoft	£8.95 (£11.95)	B/E
7	Best Four – Maths	ASK	£19.95	B/E
8	Words Words Words	ASK	£9.95 (£11.50)	B/E
9	Podd	ASK	£9.95 (£11.50)	B/E
10	French Mistress A and B	Kosmos	£8.95	B

B = BBC. E = Electron. Prices in brackets are for disc versions.
Compiled by RAM/Computer with the assistance of Proteus distribution.

Learning by Going Solo

CHILDREN with learning difficulties have been found to benefit greatly from the use of micros, especially when the computers are interfaced to such devices as the Concept Keyboard. The Coventry Computer Based Learning Unit has produced a unit of materials for those with moderate learning difficulties in the older age-range.

Going Solo aims to develop life skills through various topics – Budgeting, Shopping, Job Applications and Time – all of which can be bought separately.

Information and order forms from: CBL Unit, Greyfriars Lane, Coventry CV1 2GY. Tel: (0203) 553241.

Free introductory courses support authoring package

LAST Adventure is an authoring package which may be used to generate adventures and simulations for classroom use, available from MACE (Microelectronics and Computers in Education).

It has a graphics editor which provides the option to include half-screen pictures in each scene. Timing and report functions are available as well as the ability to use the function keys or Star Microterminal's Concept Keyboard.

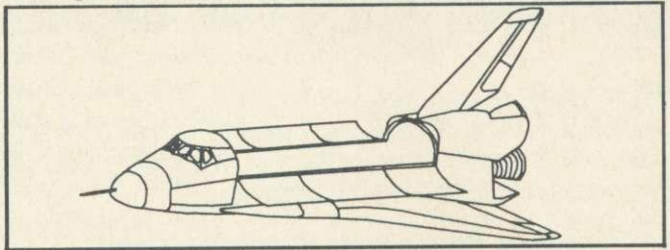
MACE is offering to support the package with free introductory courses for LEAs buying it.

Details are available from the publishers, LTS, Haydon House, Alcester Road, Studley, Warwicks B80 7AP. Tel: (0386) 792617.

Plotmate provides scope for graphics

THE Plotmate flat-bed plotter from Linear Graphics, designed with education and small business in mind, provides a robust and versatile machine.

Using the system software provided, standard BBC graphics commands control the Plotmate directly, enabling the user to write his or her own programs to create high-quality graphics output. Other specialist graphics packages will run with the machine but purpose-designed software packages are available from Linear Graphics.



Plotmate has high quality graphics capabilities

The plotter may also be used with other machines by using the Inter-mate interface through the RS232 port or Centronics interfaces.

Contact Linear Graphics at 28 Purdeys Way, Purdeys Industrial Estate, Rochford, Essex. Tel: (0702) 541664.

A-level teaching aid response

IN response to my comment that there was little A-level software around (*Vectors* review, *AU* April '85) Brian Farrimond sent me a copy of *Binomial and Poisson Distributions*, software designed for use in the teaching of Statistics A-level and equivalent BTEC courses.

Originally intended to show graphically the conditions for a Normal approximation to the two distributions, Mr Farrimond has found them useful in many other similar problems and offers the cassette of programs at £4. The address is: B T Farrimond, 23 Swinley Lane, Wigan WN1 2EB.

Interactive video ideas

◀ *continued*

engineer setting up the system, certain fundamental principles are relevant: the screen should show the status of the system, either continuously or in response to a command from the keyboard. Communication must be two-way between computer and disc player and vice versa, and here it is important that command characters are echoed to the screen so that a breakdown in communication may be seen. There should be an interrupt capability, breaking into the flow of the dialogue so that system commands may be implemented. Different input devices should be considered. The qwerty keyboard is not necessarily the most appropriate one for this sort of work and much success has been had with children in this project using joysticks and concept keyboards.

The *scenario writer* is in charge of formulating how the material should be presented, the routes through the materials and the ways in which the teaching process, developed by the teacher/author, is to be executed.

Scenarios

He must relate his materials to an 'active' disc – one that can be searched by frames – and working in conjunction with this disc he must develop certain scenarios. For example, the 'stop and do' scenario in which the presentation is halted and the student performs the task required of him. This contrasts with the 'do non-stop' scenario which might present a piece of information in the form of a sequence of video frames and overlay from the computer.

He may also consider the point raised in the previous section of using different input devices and invent ways of interfacing these with the system. The scenario writer must also be able to represent his scenario in a coherent form as a flow chart.

The duty of the *teacher/author* is to implement the educational principles to be put over by the video presentation. He will be using an authoring package that enables the development of dialogue between machines and student. He must try, as with any CAL application, to present a varied and stimulating environment, moving from the serious to the amusing, from concrete to abstract, from simple to complex and from guided to unguided – all these in response to the reactions of the user. His applications software is intended to relate meaning to the image and, if he fails, then all is wasted.

The *learner* also has some demands made of him, some extrinsic and some intrinsic to the program. A trace of the pupil's responses and his progress through the scheme is vital for feedback of information, not only about him but also about the effectiveness of the system. The student should have control over time so that he may decide when to continue and when to stop and think. A truly interactive system will not only teach but will also learn, and this system of propagative learning passes on information not only to the student but also from the student, not only from the teacher but to the teacher.

Debate

M. Dubreuil is interested in feed-back from teachers using an interactive video system. He is using the Micral AT22-9 microcomputer, but these points have a great deal of importance for those developing materials in this country. It may be that you are not totally in agreement with some of the ideas above. A continuing debate would certainly be of use to all people involved in this type of development.

Contact Bernard Dubreuil at the Institut National de Recherche Pédagogique, 91, Rue Cabriel Péri, 92120 Montrouge, France. The National Interactive Video Centre is at 27 Marylebone Road, London NW1 5JS. Tel: (01) 935 8190.

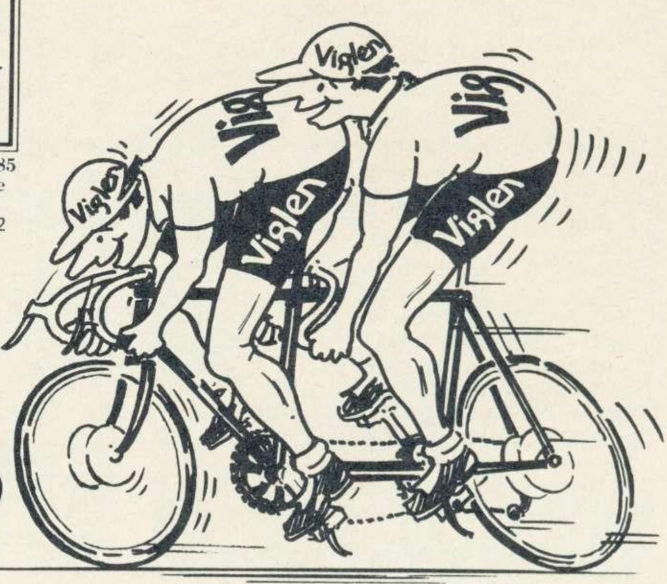
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INTERACTION



Schoolfax, a versatile teletext emulator . . .

Communications as an educational medium is still in its infancy in many respects. Although there are many different applications, some of which are catalogued here, the number of people using, for instance, Prestel is small because of the expense involved. Chris Drage and Nick Evans suggest some alternatives as well as probing the applications for some of the more sophisticated systems.

VIEWDATA systems have an important role to play in the development of information skills. Their implementation can lead to work on the nature of information, its classification, its sources and its bias. It can also promote retrieval skills, planning of logical search and use of indexes, and encourage advanced reading skills such as skimming and scanning.

Using Prestel is expensive and often impractical as it ties up the school's only telephone line. Teletext systems such as Ceefax and Oracle are of restricted use because they are not interactive.

With the limitations of these public systems it seems sensible to implement a local viewdata system that runs on both stand-alone computers and on network and does not rely on expensive modems and teletext adapters. Its pages need only contain information relevant to a particular establishment. *Schoolfax* is just such a system.

Readers will be familiar with *Edfax*, the teletext emulator program for schools reviewed in *Acorn User*, July 1984. Unlike *Edfax*, *Schoolfax* offers some very sophisticated facilities. The package comprises a systems disc containing eight programs, a 52-page demonstration file and a 27-page manual. It was developed at New College, Swindon, where it manages a 4500-page database on an E-Net network utilising a 40Mb Winchester as backing storage. This is where the range and scope of *Schoolfax* can be appreciated.

Essentially, *Schoolfax* is a suite of programs that allow the creation, editing and display of viewdata files. Pages may be created from scratch or downloaded automatically from Ceefax or Oracle and subsequently edited using the EDIT program before inclusion in the file. An important feature of *Schoolfax* is that of linked pages, allowing routing through the file. A carousel option is also offered.

At New College, Swindon, groups of students update some 150 pages of the database each morning using the automatic download from Ceefax/Oracle. The *Schoolfax*/E-Net system allows 20 students simultaneously to edit and 'slot in' these new pages all in half an hour. Thus, up-to-date news and information are always available on the network. *Schoolfax* allows subfiles of the main file to be made.

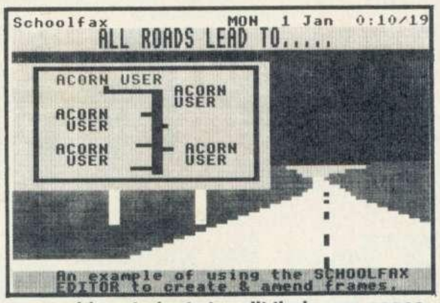
At New College specific subfiles are created that carousel on stand-alone computers in the refectory and library.

All this may seem a little pie-in-the-sky for a small primary school with one micro. On balance *Edfax* comes out as the better package in this respect. It has been designed with beginners in mind and it costs only £20.

But various users have pointed out a number of shortcomings in the system. The major criticisms are:

- The inability of *Edfax* to 'grab' pages from Teletext or Prestel, etc, to include in an *Edfax* file.
- Not being able to transfer other *Edfax* files/frames into the system.
- The lack of a multi-tone printer utility.

Tecmedia, which publishes *Edfax*, is now well aware of users' needs and at the time of writing is preparing a Mark 2 version, which will remedy most of these shortcomings. However, teachers may not be aware that an excellent suite of *Edfax* utilities is already available from Ephagy Software Products. Entitled *Texprint*, the suite upgrades *Edfax*'s facilities to a level almost comparable with New College's *Schoolfax*.



. . . enables students to edit their own pages

'EDUTIL' is the star of the suite. Its ability to scan through *Edfax* files quickly or to transfer files from other systems is a joy. An impressive feature is the ability to drive a frame around the screen and position it via the arrow keys (having first loaded it from a file, of course). The much-needed printer dump is there too.

The £20 for *Edfax* plus £10.95 for *Texprint* may make some schools think twice. *Schoolfax* at £30 may be a better choice.

For schools with limited resources I would draw attention to Joe Telford's excellent Eco-Fax trilogy described in the January '85 issue of *Acorn User*. For a mere £3.75 (the *Acorn User* monthly cassette) you get a set of programs whose facilities almost rival those of *Edfax*.

Prestel is different from teletext for several reasons – the main ones being that it isn't free and it *is* interactive. You want to know what to do with it in school? Help is at hand. The Prestel Education service – not to be confused with Micronet which is a CUG (closed user group) – provides pages on which may be found features, competitions, applications, news and reviews, all controlled by the Council for Education Technology (CET). The ECCTIS courses guide for higher education is stored on the Open University's computer and may be accessed through these pages, as may be the COIC careers guide. *ED.IT* is an information technology magazine that aims to spark off ideas among teachers, and there are many other facilities besides.

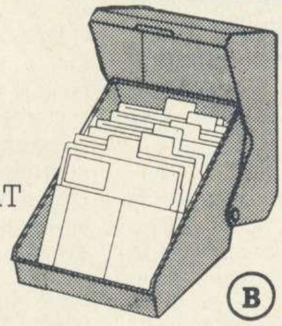
Micronet, on the other hand, provides a service of interest to pre-school and infant teachers with telesoftware and information.

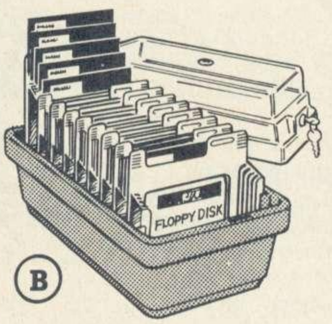
A further step up the ladder is The Times Network for Schools (TTNS), which runs on the lines of the Telecom Gold system, but on an independent

Continued on page 135 ▶

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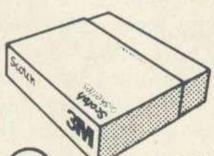

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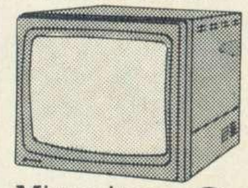

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TWO West London lads, Navneet Gupta and Ian Pratt, are about to take on BT's Prestel viewdata service. Well almost. The two 14-year-olds have certainly achieved one thing: proving how simple it is to set up and run a view-database when given the appropriate software tools. The 'tool' in this instance is Communitel's Level 2 Viewdata System.

The boys have known each other for two years and have spent a good deal of that time beavering away on their BBC micros. In the past year Navneet has been involved in editing on Micronet 800 and this experience has led both youngsters to create their own public viewdata service 'Beeb Link'. Beeb Link will eventually have 195 pages of information, plus a mailbox facility for callers to leave messages.

Navneet: 'One of the main qualities of the system is the fact that it has an excellent mode 7 editor – the best I've seen implemented on a standard Beeb. It even implements complete Prestel standard routing facilities.'

Ian: 'I particularly liked the two very comprehensive manuals: one is an excellent guide for beginners with lots of colour photos and diagrams. The reference manual explains from beginning to end almost all the info you need to know to edit on a viewdata terminal. The system has a "mini on-line search system", which enables a search facility. Another feature I like is the carousel facility, which is useful for demonstrations, advertising, etc.'

Navneet: 'I think the host system software is very good as it allows creation of a mini-Prestel system (with mailbox facility) for the database, if used with the Communitel modem.'

Other features that impressed the boys were:

- The flexibility of the system, with options such as: altering information-provider's headings; working with all disc drive configurations; and screen dumping to any of six popular printers.
- The facility to turn interlace off (sharpening up the character set).
- Fully second processor compatible (ie, it also runs much faster).

However, Ian adds: 'There are one or two improvements I would like to see: the mailbox facility isn't at all easy to use for the first-time "logger-on". I would like to have seen some bulk-updating software for use with the package and the Dacom 2123 modem specifically, as it has the facility to send frames quickly to Prestel.'

And Navneet comments: 'The modem is excellent but I would like to see user-to-user software included to allow users to communicate directly outside the Communitel system. Unfortunately, the editor doesn't tell you the number of characters on-screen. This has meant that often my graphics frames have exceeded the Prestel limit of 920 characters per frame (740 per response frame). It is a small point but can be annoying.'

There can be no doubt that the extent of Navneet and Ian's success is due to the superb design and execution of Communitel's powerful package. Equal credit must go to their perseverance and dedication in producing and refining their viewdata base. Navneet says: 'It has taken us three months, working every day for about 2-3 hours. But it's paying off because some people are already logging on.'

◀ *Continued from page 133*

PRIME computer. All the facilities of Gold are available except that mail may not go outside the system. Instant mailing to multiple destinations, databases of information provided by industry, facilities for creation of databases relevant to individual areas, graphics, interactive 'chat' capability – these are just some of the facilities available.

More exciting, however, is the prospect of following the development of Operation Raleigh with regular updates from the crew – ideal for topic work. Furthermore, the Stock Exchange is keeping a set of information of the top 100 companies on the network with competitions of the Portfolio type for schools to play. In the same line is the Business Awareness Club, run by Arthur Anderson, the international firm of accountants.

Careers information may be had from a variety of sources, including the armed forces, and a database of commonly asked questions and answers relating to technology is being compiled by Memorex.

Finally, those wishing to go on to higher education will have the facilities of the Polytechnics Central Admissions System available by the summer of '86. This will provide interchange of information with mailboxes in schools and polytechnics. There is a lot going on at TTNS but it is early days yet. Given a chance and a little help and encouragement it could prove to be an invaluable resource.

Integration of these facilities into the classroom requires some change in organisation. Some questions to ask yourself are: 'What am I expecting to do better with this facility?'; 'How will I organise the children's time at the computer? (remember the expense!)'; 'Can I take information off the system, save the pages on disc and present it through a teletext editor?'; and 'Will the information I want the children to look at be interesting to them, motivating and relevant to their needs?'

The implication of all of this is that the teacher must be totally familiar with the system first. Remember that most remote systems are cheaper, like phone calls, after 6pm. Prestel makes no charges then. Integrating material, either in teletext form or merely using the computer as a source for written work requires careful planning and preparation.

Many of the systems mentioned above are now aiming to integrate topic plans with their presentations. They are looking for ideas, so this could be your big chance.

ADDRESSES

Council for Education Technology, 3 Devonshire Street, London WIN 2BA.
The Times Network for Schools, PO Box 7, 200 Grays Inn Road, London WCIX 8EZ.

TEXTPRINT DATA

Supplier: Ephagy Software, 125 Corporation Road, Grimsby.
Machine: BBC B. **Price:** £10.95 (disc).
Tecmedia, 5 Grandby Street, Loughborough LE11 3DU. Tel: (0909) 438301.

COMMUNITEL LEVEL 2 VIEWDATA SYSTEM DATA

Supplier: Communitel Ltd, 189 Freston Road, London W10 6TH.
Machine: BBC B (disc).
Price: Level 2 System: £375 + VAT.
Local System: £45 + VAT.

SCHOOLFAX DATA

Supplier: Schoolfax, 24 Somerset Road, Swindon, Wiltshire SN2 1NF.
Machine: BBC B (disc and/or network interface).
Price: £30 (disc) £7.50 (additional *Schoolfax* utilities) £7.50 (additional E-Net utilities).

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BBC Model B (including £50 of software)	£299 + VAT £344
BBC Model B with disc interface	£346 + VAT £399
BBC Model B with econet interface	£349 + VAT £401
BBC Model B with disc and econet interface	£399 + VAT £459
6502 Second Processor	£173 + VAT £199
Z80 Second Processor	£346 + VAT £399
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Winchester Disc Drive - 10MB	£1304 + VAT £1499
Winchester Disc Drive - 30MB	£1999 + VAT £2299
BBC Prestel Receiver	£121 + VAT £139
BBC Teletext Receiver	£196 + VAT £225
Acorn Bitstick	£328 + VAT £377
Acorn Bitstick multi-plotter driver	£69 + VAT £79
A to B upgrade kit (inc. fitting)	£90 + VAT £103
Econet interface (inc. fitting)	£60 + VAT £69
Disc interface (inc. fitting)	£103 + VAT £118
Speech upgrade	£48 + VAT £55
Games Paddles	£13 + VAT £15
IEEE Interface	£284 + VAT £327
Intelligent Printer Buffer/Sharer	£245 + VAT £282
AMX Mouse	£75 + VAT £87
Tracker Ball	£52 + VAT £60
Grafpad	£120 + VAT £138
ISO-PASCAL (BBC)	£50 + VAT £58
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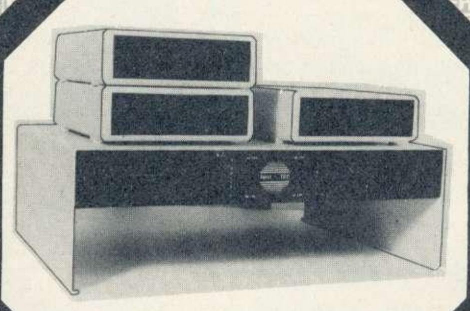
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Spare daisywheel .... **£14 + VAT £16**
Juki 6100 ribbon .... **£2 + VAT £2.30**

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RX80 100CPS 10 inch wide tractor feed .... **£215 + VAT £248**

RX100 F/T 100CPS friction and tractor feed .... **£349 + VAT £401**

LX80 NEW Epson printer with NLQ .... **£229 + VAT £264**

LX80 Tractor unit .... **£20 + VAT £23**

8143 RS232 Interface for FX and RX printers .... **£39 + VAT £45**

8148 RS232 Interface with 2k buffers, X on X off .... **£60 + VAT £69**

Ribbon Cartridge for RX80, FX80 and MX80 .... **£5 + VAT £6**

Ribbon Cartridge for FX100 and MX 100 .... **£7 + VAT £8**

MP165 165CPS 10 inch wide friction and tractor feed. NLQ Epson compatible .... **£239 + VAT £275**

CANON PW1080A 160CPS 10inch wide friction and tractor feed, NLQ .... **£255 + VAT £294**

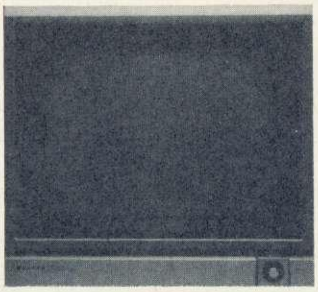
CANON PW1156A 160CPS., 15 inch wide friction feed NLQ .... **£359 + VAT £413**

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DIAL A DATABASE

Geoff Nairn gets on-line to the wide world of information sources

WHEN Alexander Graham Bell invented the telephone in 1876 little did he realise that, a hundred years on, the telephone system would be carrying some decidedly non-human conversations. For computer communications has replaced voice traffic as the growth area for the telecommunications industry, and while many of these 'value added' services are aimed at commercial customers – with prices to match – the humble Beeb owner can also get in on the act. Electronic mail, viewdata services, specialised databases and on-line computer clubs are just some of the services accessible by anyone with a micro and a modem.

Perhaps the most familiar on-line information service is Prestel, British Telecom's viewdata system. After somewhat shaky beginnings the service is now starting to take off among home computer owners, as it offers cheap access to more than 350,000 pages of information, including its own dedicated section for micro owners – Micronet 800 (see review on page 143). Other viewdata systems have followed, either private in-house commercial services, such as the Stock Exchange's Topic share price system, or smaller public services, such as one run by the London Borough of Hackney that offers pages of local information and is accessible from terminals in public libraries.

The trouble with viewdata information systems is that they are designed for access by dumb terminals via a simple keypad. By keying in numbers chosen from menu pages you work your way deeper and deeper into the database until you find what you're looking for. This hit-and-miss process is unsuitable for those with exacting information requirements. For these users a range of specialised on-line information services, with sophisticated search facilities, have sprung up during the past decade.

The one that started it all was Dialog, which opened to the public in 1972. This is by far the largest public access service, with more than 60,000 users in Europe and the US and 120 million records. Dialog is run from a mainframe computer (the database takes up 10^{12} bytes of storage capacity!) in California and as such would be very expensive for home subscribers to use. Dialog Information Services has therefore introduced an 'economy model' called Knowledge Index, which has a mere 30 million records of the more popular sections of Dialog and can be accessed only during the evenings and at weekends, when the Dialog mainframe is underused.

Knowledge Index is accessed from the UK using Dialnet, a special communications link connected to the Packet SwitchStream (PSS) service. This means that you don't have to pay transatlantic call charges – just the cost of a call to the nearest PSS 'node' in the UK and a time-based charge for using the Dialog mainframe – about £23 per hour. In addition there's a one-off subscription of £25. What do you get for your money?

Knowledge Index contains 27 distinct databases, including medical and biological abstracts, legal information, magazines, government publications, education, computers and newspapers. To search for information on a specific subject, therefore, you have to choose first which database to use: for example, BEGIN COMP3, which puts us into the Microcomputer Index database (called COMP3). Now say we wanted to find out something about Acorn Computers: you would enter FIND ACORN. In fact this finds 39 references to Acorn, which is too many to browse through quickly so we might narrow down the search: FIND ACORN AND BBC MICRO would produce a smaller set of references to all items about Acorn and the BBC micro. And so on, until you find what you're looking for.

The trick in using Knowledge Index is to think of a few keywords that neatly encapsulate the specific topic you are looking for and which can then be used to narrow down your search rapidly; otherwise, you can clock up a hefty bill ploughing through irrelevent references. There are a variety of search operators – AND, OR, NOT – and 'wild cards' to help you with this. Once you've found a few suitable references the DISPLAY command will show the items on the screen, either in full or just the title. If you've got some intelligent terminal emulator software you can then save these on disc and read them later off-line – remember that time is money with Knowledge Index.

With a little bit of practice and some forethought, Knowledge Index can be used to find out quickly where to look for a specific subject. It does not store complete articles, just references – author, subject and a brief description – so you may still have to go out and track down the specific article in a library. As you may have guessed, Knowledge Index is aimed primarily at serious professional users and is popular with academic institutions, where the time saved over leafing through conventional abstracts and indexes can be considerable. Just to show the quality of the information stored in Knowledge

DATABASE DIRECTORY

Service	Speed	Costs	Contact	Type of information
Micronet	1200/75	£16.50/qtr	01-278 3143	home/general
Lexis	1200	£10/hr	01-404 4097	legal
Nexis	1200	£10/hr	01-404 4097	news
Polis	300 + 1200	£55/hr	0908 565656	parliamentary
The Source	300 + 1200	$7.75/hr (min)	*see below*	general, business
Compuserve	300 + 1200	$6/hr (min)	*see below*	general, business
Knowledge Index	300 + 1200	$24/hr	0865 730969	scientific, news
World Reporter	300 + 1200	£60/hr	09327 85566	news

NB Phone numbers are for further information and are not the phone numbers of the host computers. Costs given represent computer time charges. There may be additional subscription charges and telephone call costs. **Compuserve,** 500 Arlington Center Boulevard, Columbus, Ohio 43220, USA. **The Source,** 1616 Anderson Road, McLean, Virginia 22102, USA.

Index, I managed to dig out 37 references to *Acorn User* and a summary of Bruce Smith's October 1984 article on Toolkit ROMs (right).

In a similar vein to Knowledge Index is Datasolve's World Reporter, an online news retrieval service which draws on 14 different news sources, including the *Guardian* and *Financial Times*, a summary of BBC world broadcasts and a Japanese news service. Half a million articles – complete articles, not just summaries – are stored on World Reporter stretching back over the past couple of years or so, and they can be searched and displayed in a similar fashion to Knowledge Index. Accessed either through PSS or by dialling the Datasolve computer direct, it costs £60 per hour, after an initial prepayment of £200. The 350 users divide equally between government, media and business customers.

Other commercial on-line databases include: Nexis, a comprehensive newspaper and magazine research service; Lexis, a database of legal cases for lawyers; Blaise, the British Library's electronic indexing system; Polis, the Houses of Parliament's own database; and Share Price Data, with daily prices of commodities and stocks. There's even a database of databases, run by the EEC! To find out more about this useful Luxembourg-based service phone 010-352 488041.

In the US, where dial-up databases first originated, there are two services catering more for the home user: Compuserve and The Source. Compuserve has more than 800 subject areas and over 150,000 users. Special interest group (SIG) areas are catered for, such as for Apple users. There are bulletin boards where subscribers can leave messages; a chat facility; games, including a multi-user *Star Wars*-type game; business information; news and so on. The Source has a similarly massive range of facilities and both services cost between $6 and $20 per hour, depending on what time you call.

Access to these US services from the UK is either via a direct call, in which case you'll need a modem which uses American (Bell) tones and a lot of money, or via IPSS, the international version of the Packet SwitchStream digital communications service. Using IPSS, how much you pay depends on the time of day, the country you're dialling, how long you spend on the system, how much data is carried, and the cost of the local phone call to a PSS exchange. Even so, it normally works out cheaper than calling the USA direct, though you first need to buy a PSS 'identity' off British Telecom. This costs £25 and then £6.25 a quarter. For information on exactly what PSS is and how you join contact PSS Customer Services Group on 01-920 0661.

```
                  Display 22/L/4
1086378    ACU84J0157
    Toolkits on Trial.
    Smith, B.
    Acorn User  No.27, Oct. 1984, P. 157,159+. 3 Pages.
    Country of Publication: United Kingdom   Language: English
    Availability: Available from Management Contents
    Document  Type:   Journal    Article  Type:  Software Review;
Product Evaluation
    Special Features:     includes Screen Displays; Tables
    The BBC micro can accept a variety of ROM based software that
can be used together with BASIC.  Many  of  these  ROMs  contain
BASIC  programming  aids or utilities.  BBCSoft's Toolbox is the
only serious tape-based  utility  software  available.   Toolbox
provides  twenty-five  utilities.  Other utility packages on the
market include  Addcomm,   Toolkit,   Caretaker,   Toolstar  and
U-Tools.   Sample  program  listings  and comparative tables are
included.
    Descriptors: Program Development Tools; ROM; Utility Programs
; Evaluation; Microcomputers
```

Data supplied by Knowledge Index, with details of an article by someone called Smith

In this country the Times Network for Schools is probably the closest thing to Compuserve or The Source, although it's available only to schools and colleges at the moment. It is basically a closed section of British Telecom's Telecom Gold electronic mail service. For £187 per year a school gains access to a searchable database of educational information, noticeboard sections, local news, educational software reviews, electronic mail facilities and downloadable software. It can even mimic a viewdata system and so offer pages of colour and graphics. It is likely that the Times Network will expand outside the education sector and no-one is discounting a move into the home user market.

All the databases mentioned above are somewhat pricey, and for the impoverished BBC micro owner the growing number of electronic bulletin boards offer a cheap and cheerful introduction to dial-up services. All it will cost you to use a bulletin board (BB) service is the price of a phone call. Run by enthusiastic amateurs from home (and using their own money), the BBs allow you to leave messages for other users, advertise goods for sale and swap programs.

Unfortunately, nearly all BBs work at 300 baud, so those of you with Prestel-type 1200/75 baud modems are out of luck. Also they are often permanently engaged, as they can handle only one caller at a time. Understandably then once you get onto a BB you'll not want to log-off in a hurry. The system operator (sysop) will unceremoniously disconnect you after half an hour or so, however. They are not the most user-friendly of systems and finding your way around can be a bit of a problem, especially if you're new to a board.

If you have tried to log onto a BB but have been thwarted by the engaged tone you could try Rewtel. This is a BB run by an electronics magazine and in addition to a messaging facility – you enter CHALK to select it – there's a database of electronics components and related information. If you take out a subscription to Rewtel you can even order stock components via the BB. Non-subscribers can still use the other sections of the BB and are allowed eight minutes. Distel and Maptel are similar database services run by electronic components companies and, like Rewtel, they are not as frequently engaged as the amateur boards.

For numbers and details of BBs see *Acorn User*, October 1984 and for new BBs see *AU* Noticeboard page. BBs are run on a voluntary basis, so phone numbers and hours can change.

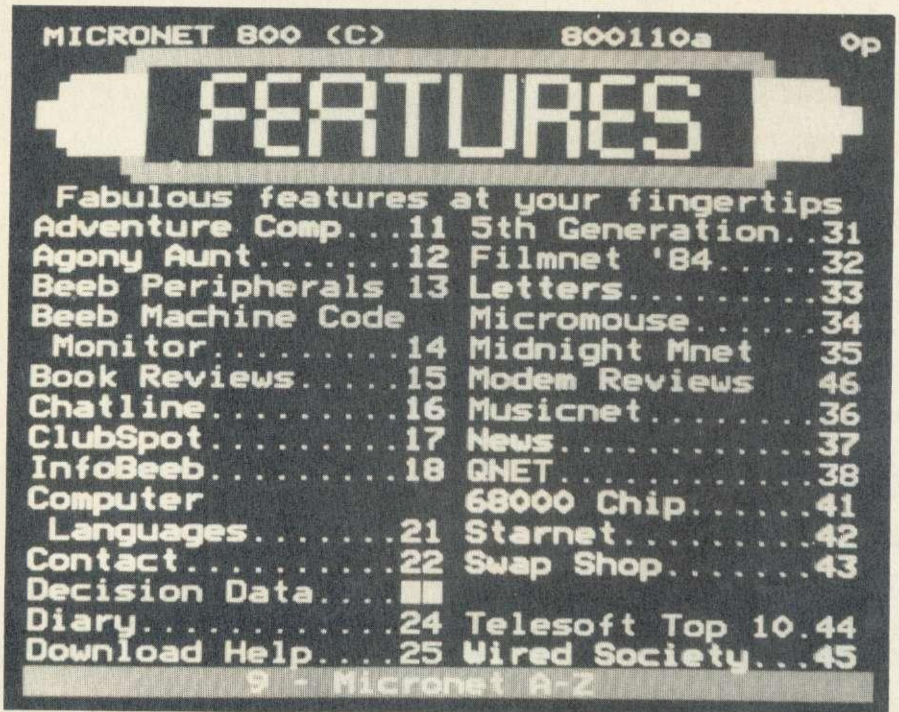
Here you have seen just some of the services that you can access using your Beeb and a modem. If you want to have a go at all of them then not only will you need a healthy bank balance but also a multi-standard modem and some sophisticated terminal emulator software. I used Computer Concept's Termi ROM and had no problem accessing any of the services – even downloading files from California onto Econet, which is pretty impressive in anyone's book. Inevitably you'll have to experiment with the various protocol and emulation options.

With the availability of cheap modems, price-cutting on long-distance telephone tariffs and new data carrier services such as PSS, the humble microcomputer can now go on-line just like its big brother, the mainframe. But remember, we humans like to use the phone as well!

For a guided tour of some of the bulletin boards in the UK, see page 151

Geoff Nairn strolls around 40,000 pages of viewdata

SLIP THROUGH THE MICRONET



Micronet's index of features – some more 'fabulous' than others

THE Prestel public viewdata service will be six years old next month but so far it's had a difficult childhood. The public at large never really warmed to the concept of instant information at the touch of a few buttons, and for commercial users the information available has been pretty worthless. But if the original markets have not lived up to expectations then the home computers boom, coupled with the availability of cheap modems, has saved the day for Prestel.

Viewdata technology was the brainchild of a Post Office research engineer called Sam Fedida who, in 1970, came up with the idea of an electronic information service accessed via the public telephone network. The Post Office saw Prestel – as the service came to be known – as the first step towards a wired society and was forecasting more than a million Prestel users by the end of the decade. When the service actually got off the ground in 1979 and some £50 million had been spent that estimate had come down to nearer 100,000. By the end of of 1984 the actual number of subscribers to Prestel – the world's first public viewdata system, incidentally – was just 45,000. So what went wrong?

When Prestel was first conceived, home computers were practically non-existent and so access was to be via dedicated dumb terminals – a modem, a monitor screen, a numeric keypad and a few bits of electronics. The information would be transmitted as numbered pages of coloured text and graphics, each page containing only 1k of information, for memory chips were then very expensive. Thus the service is not only time-consuming and cumbersome to use – involving ploughing through terminable menus and routeing pages – but when you eventually find what you're looking for there's only about 100 words to each page. As an on-line information service it leaves a lot to be desired.

If the general public and business community couldn't see a use for Prestel, then East Midland Allied Press (EMAP) could and in 1983 it set up Micronet 800, a specialised area within the Prestel database containing information of specific interest to home computer owners. Home computers such as the BBC micro already contain the necessary hardware to display viewdata information: all that is needed is suitable software and a modem. So when Micronet 800 first began operations it offered a modem, communications software and subscriptions to Micronet and Prestel for an all-in price. Moreover, it was thought, the average home computer buff would actually enjoy wandering aimlessly around Micronet's myriad pages; what was a drawback to other Prestel users was a positive selling point for micro owners.

Since 1983 Micronet 800 has grown to become the most popular information provider (IP) on Prestel, with more than 5.6 million 'frame accesses' a month. There are 16,000 Micronet subscribers, most using a BBC micro.

With the wide availability of cheap direct-connect modems and sophisticated communications software, Micronet has withdrawn from selling the hardware and software, and now offers a combined Prestel/Micronet subscription for £16.50 a quarter (about £1.30 a week). On top of that there's the telephone charge, which works out at 40p an hour for a cheap-rate local call (after 6 pm and at weekends). (Prestel is available at local call tariffs to 97 per cent of UK telephone subscribers.) In addition, some pages carry frame charges, and if you use Micronet during the working week not only does the cost of the telephone call increase but you also have to pay connection-time charges of 5p a minute. All this, plus the cost of the modem and software, can make using Micronet an expensive business, so what do you get for your money?

Micronet 800 is a closed section of the Prestel database, accessed from Prestel page 800 – hence the name. At the last count it contained more than 40,000 pages of information, including the latest microcomputer news, readers' letters, programming tips, software and hardware reviews, and anything of interest to your average home computer buff. But information is just part of the story, for there's also a

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Total £. . . . .

Access

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ADDRESS . . . .

. . . . POSTCODE . . . .

growing range of telesoftware that can be downloaded into your BBC micro (or other machine) and saved on tape or disc. And one aspect of Micronet that has really taken off is communications, ranging from late-night 'chats' with other subscribers and electronic mail-boxes to an Agony Aunt page!

As with Prestel, information is why it all started, and despite the severe limitations of using a viewdata-based system, there's a wealth of specialist information on Micronet – if you can find it. Unlike professional information retrieval systems, such as Knowledge Index or The Source, Micronet does not allow for true database searching, by keywords or headings, for example. Again, this is a consequence of Prestel's having been designed to work with dumb keypad terminals. So information is accessed from on-screen menu pages by keying in numbers that route you to a sub-menu, and so on until you reach the required information. A tree structure such as this can be frustrating to use, for once you've gone so far down a certain 'branch' of the tree it can be difficult to climb back up again if it turns out to be the wrong branch.

The problem is compounded by the somewhat cryptic items that appear on the menus and the illogical way in which the page numbers in the top right corner of the screen jump around when moving from one page to another. Micronet recommends that you write down the numbers of any favourite pages so that they can be quickly accessed next time by keying in directly, but as some of the page numbers have up to nine digits that seems just as tedious. This may sound like carping and I'm sure many Micronet users enjoy discovering uncharted territory within the database, but for inexperienced users it can be a frustrating process not being able to find what you're looking for while you line the pockets of the British Telecom shareholders.

Micronet has many smaller databases within its pages, either for specialist interest groups (SIGs) or for specific makes of micro. For example, *Electrobeeb* is an electronic 'magazine' for BBC micro users and currently contains details of *Elite* high scores, programming tips for graphics on the Beeb, a question-and-answer service, a hints and tips section, and some free telesoftware. The Labour Party is a SIG on Micronet and has its own private database of 100 pages of both political and computer club information. Another SIG is *Micromouse*, an 'alternative' database which, on the day I looked at it, was running a story about German hackers.

And so it goes on. Other information



500 people read every Chatline message



Bulletin board for 'electonic' messages

pages cover the whole range of hardware and software news, magazine-type articles, competitions, ads and technical information; I'm not sure even Micronet worries too much about what's on the system as long as it's not obscene and is actually looked at now and again.

The telesoftware pages are accessed from the Software Supermarket and for the BBC micro there are more than 50 games to choose from, as well as a Bargain Basement of games growing old gracefully. Some are free, but you have to pay for most of the good ones and prices are typically 20 per cent cheaper than buying them as a conventional cassette tape. Before downloading a game you can read a review to see whether you want it; if so the cost will be added to your quarterly Micronet bill. Telesoftware is transmitted frame by frame, but don't try it if there's a lot of line noise or if your software doesn't check for errors.

Perhaps the most popular feature of Micronet is the interactive communications and especially the Mailbox service. Every Micronet subscriber gets a free 'mailbox' to which other Micronet users can address messages, which can be read at your leisure. It is claimed to be cheaper than sending someone a message by conventional letter post and it's certainly a lot quicker. Messages are uncensored and this has led to a couple of Micronet subscribers being unceremoniously logged off the system for sending abusive messages.

If you want to talk with all and sundry then Micronet's *Chatline* service is more appropriate. *Chatline* is open from 5.30 pm on weekdays and from 2.30 pm at weekends till midnight, and for a 2p charge it allows you to send a message of up to six lines. This will then immediately appear on the *Chatline* database with up to a hundred other messages from other users, and you are free to browse through *Chatline* and respond to any of the messages. Quickness of response has made the service very popular and up to 500 people are claimed to read each message. Again, there have been problems with 'obscure' (read as obscene) messages but Micronet has chucked off persistent offenders.

In a similar vein, *Celebrity Chatline*, which goes out on Wednesday evenings, allows users to 'chat' with 'famous' personalities. Micronet's editor, David Babsky, travels to the homes of various computer personalities with trusty BBC micro and modem, and then engages aforementioned personalities in conversation, broaching questions from Micronet subscribers and putting the answers back onto the *Chatline*. Highlight of the year so far has been an interview with computer journalist Guy Kewney (who he?).

The latest Micronet service is *Gallery*, which allows any subscriber to put a page, consisting of up to 26 frames, onto the Micronet database. He or she is free to include whatever information they like in this page for a charge of 25p per frame for six months. These user pages are then automatically indexed by the author's name and so can be accessed from the main Micronet index. At the time of writing this service was not fully operational and so it remains to be seen if it suffers from 'obscure' messages as some of the other interactive services have.

Micronet 800 is very much what its users want it to be and the interactive services emphasise this point. It certainly appeals to the 'teckies' – some of the mailbox messages are abstruse to the point of being unintelligible – and Micronet is also popular with the hacking fraternity, much to British Telecom's chagrin, I imagine. It's also a good bet for newcomers to computer communications, requiring neither the patience nor expertise of the bulletin board services, nor the expenditure of some of the more specialised dial-up information services. The quarter of a million additional pages in the main Prestel database come as an added bonus to Micronet subscribers, so once you've learnt to find your way around Micronet you can get lost in Prestel. Now, don't you regret not buying shares in British Telecom?

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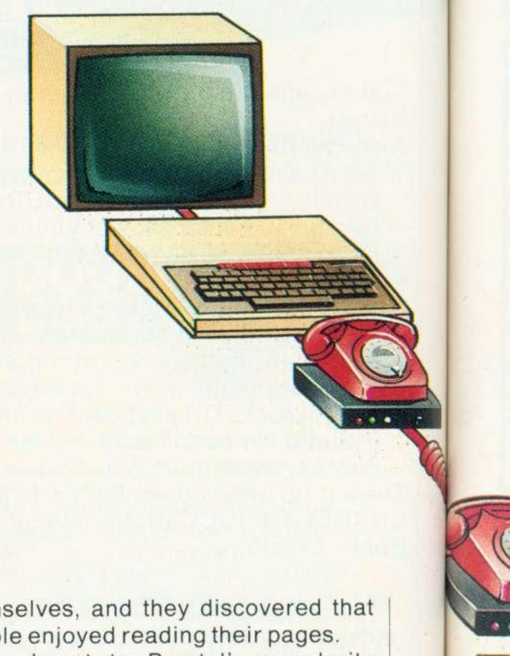
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BREW YOUR OWN PRESTEL



Become an electronic publisher with Communitel, says Robin Mudge

FOR £375 you can turn a BBC model B with disc drives into a complete do-it-yourself Prestel system. The Communitel package consist of an editing terminal to let you compose and arrange pages of text and graphics, a 'cruncher' to turn your own programs into telesoftware, a host system which makes your micro look like a Prestel computer and an intelligent auto-answer modem to answer the phone and connect your micro to others through the phone system. With all this chugging away on your machine, anybody ringing your number using a computer and Prestel terminal software, or indeed an ordinary Prestel terminal, wouldn't know the difference between your home-brew Prestel and British Telecom's, except by the kind of information, of course. Before describing Communitel in detail I'll explain what Prestel is.

For those who don't know, it's a large commercial public computer database, which uses the telephone to present information by videotext on a visual display unit (VDU). Prestel was one of the first videotext systems, and it established three standards for information interchange using computers: first, to cover the technical aspects of connecting the computers together (RS232, 1200/75 baud); second, the presentation of information such as character set, type of graphics and colours; and third, the way users interact with the systems – what the response keys are, how you get the menus, etc.

Of course using Prestel can be expensive – it's a profit-making organisation and the kind of information available reflects this. The information held on its database is largely supplied by independent 'information providers' – a new breed of electronic publishers, themselves mostly commercial organisations. Their information can be charged for by the page, the cost of which is displayed. Revenue is collected by British Telecom through the usual telephone billing system and sent to the information provider, after BT has deducted its service charges. So the subscriber has to bear the cost of the telephone call to a Prestel computer, a charge for the use of the computer and sometimes a charge per page. Prestel might seem to have a great deal to offer anybody wishing to distribute information, but the charges exclude most non-profit making organisations. More worryingly, there has been concern that some information might not have met with Prestel's approval, and so has not been made available to the general public.

Communitel is a do-it-yourself Prestel system that offers a great deal to people wanting to become information providers and electronic publishers. It overcomes the cost problems and any form of censorship is limited to disconnection of your telephone.

The package has been written by, and is sold by, a small company based at the Nottingdale Technology Centre, deep in the heart of London's Shepherds Bush. Nottingdale is one of a nationwide network of community-based ITECs (Information Technology Exchange Centres) funded by the government.

Bill Olivier has been working on the Communitel project since 1979, and wrote software to turn the BBC micro into an editing terminal. I saw the system at this stage and was very impressed by the effect it had on young people who obviously had not found writing a particularly easy thing to do. They were freely writing very interesting and lengthy articles for the in-house viewdata magazine. The screen presentation and graphics had given them a previously unfound confidence in themselves, and they discovered that people enjoyed reading their pages.

The boost to Prestel's popularity from connecting up micro users through Micronet gave Bill and his collegues a spark of inspiration. They already had a closed videotext system, so all they had to do was make the BBC micro work like a Prestel mainframe and supply a suitable auto-answer modem and they had a home-brew Prestel system for any local community, pressure group or club. Hence Communitel.

Communitel comes in two versions, levels one and two – the latter is the full system including a page editor, communications system and modem, whereas level one includes the editor and local search facilities only. The software and documentation come in a plastic pack with two 5.25in discs. The first is the system disc and the second is a sample database which includes some interesting training pages – more about these later.

The reference manual and tutorial guide are the best written, clearest and most comprehensive I have seen.

The software itself is easy to use – insert the disc, press Shift and Break and up comes a menu straight away. A red bar is moved up and down by the cursor to highlight the required option keys, then press Return and you're off. The tutorial guide is heavily illustrated with colour screen shots and highlighted instructions, which enable the user to get started with ease. The highlighted text reflects what appears on the screen and guides the user to the choice of options and which keys to press. Screen shots show the result.

There is a rather interesting warning about changing discs when using the editor. It explains that the disc must not be removed without following the special procedure described. This is

ILLUSTRATION BY KEVIN JONES

because of the way Communitel handles disc filing to overcome limitations imposed by the BBC DFS.

The first section deals with configuring the software to fit the user's system. Every combination of disc drives, sides and capacity, network settings, printer types and interface are covered. After this comes preparing a database disc – a disc for storing the user's pages or ones that are saved from other systems. The database disc overcomes the limitation of 31 files per disc side of the BBC disc filing system by making a single file that takes up the entire capacity of the disc. This is managed by the system software, so 195 frames can be stored on a 200k disc, 95 on a 100k disc and so on.

Once a database disc has been prepared it can be used to produce new ones by the standard back-up procedure, thus short-cutting the initial six-minute process.

Now everything is ready to start making pages. Selecting 'Hey Presto viewdata editor' brings a new program into play and a new menu page. The editor allows you to make your own frames and pages, and create your own database. The frames can use words and graphics in seven different colours and with different colour backgrounds.

Selecting the 'Set up a new page' option starts the editor. The system first asks for a page title and an identifying letter, and then presents a blank page with a status line at the top and 'on screen' menus at the bottom. Start typing and letters appear at the position of a flashing cursor. Full editing facilities are available, the cursor can be moved with the cursor keys and characters can be deleted from any position with the delete keys. This mightn't sound surprising until you look at some other viewdata editors – where, after a mistake has been made, the whole page has to be started again. The horizontal and vertical position of the cursor is shown in the status line.

All other editing functions are operated by the function keys, and there are four levels of operation. The first one handles the word-processing tasks, the second uses the Shift key to change the colour of the text, while the third one, by pressing the Control key, changes the colour of the graphics. The fourth, which uses Control and Shift keys, gives control over the height of characters, either double or single, the type of graphic character and setting a new colour background. In each case pressing the f0 key gives the appropriate menu at the bottom of the screen.

When a number of frames have been made the editor allows a database to be constructed by specifying the frames' routing. This allows the user to move from one frame to another simply by pressing a number key. The tutorial guide explains routing in a clear and practical way.

Just as on Prestel, telesoftware pages can be generated. The telesoftware program formats files of any type, such as Basic programs or data files from a wordprocessor or spreadsheet, into a compacted form. Each page contains about 1k of data, and so a large program can use a lot of them. The pages are consecutively numbered automatically by the formatter and saved onto the database disc.

Once a database has been created it can be searched as a local viewdata system or it can be put 'on line' using the modem and host section of the system. This is what eats up the bulk of your £375.

The second package you receive contains an auto-answer auto-dial modem. The modem (modulator/demodulator) turns the digital pulses issued and received by the computer into audio tones that can be carried by the telephone network.

The Communitel modem is manufactured by Dacom and is of the 'intelligent' variety. It has a built-in microprocessor and firmware. The modem connects to the micro through the RS232 port and to a separate plug-type power supply via one of those nasty 'plug in both ways round' DIN plugs. There is no need to panic, for even though it is not mentioned in the manual, the modem works with it plugged in either way.

Continued on page 154 ▶



The Communitel system creates a Prestel-type database with a 'tree' structure of connecting frames. Our picture shows how BBC micros can contact a 'host system' over telephone lines and access frames on the main database. The opening page leads to sub-menus which in turn lead into display pages. Only the system operator can access the editing frames. Computer programs can be transferred to users by telesoftware

MEMBERS OF THE BOARD

Tony Dennis logs in and delivers a news bulletin

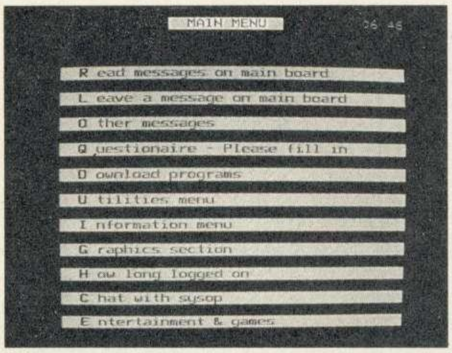
IT HAS been said that 1985 is the year of communications, and Beeb owners have grasped the opportunities with both hands. At least six software systems have appeared in the UK recently that enable the BBC micro to act as a bulletin board host. With each attracting its own satellite boards, there has been a harvest of new boards this year.

A bulletin board host program allows the micro to act as an electronic messaging service, the board sending and receiving messages via standard telephone lines. The difference between a bulletin board and a mainframe service such as Micronet is that bulletin boards can handle only one caller at a time.

The launch of Pace's *Commstar* communications software has largely been responsible for much of the interest in bulletin boards among Beeb owners. Equipped with this terminal program, plus a low-cost dual baud-rate modem such as the WS2000 from Miracle Technology (reviewed on page 159) or Pace's own Nightingale, BBC users began accessing bulletin boards in droves.

Previously, there were two popular forms of bulletin board software: TBBS, which runs mainly on Tandys, and CBBS which is aimed at CP/M machines. The disadvantages became apparent: TBBS was expensive, while CBBS was relatively unfriendly. Neither was aimed directly at Acorn users. This gave the spur to users to create their own host software. There is no general agreement as to the first person to achieve this, but Robert O'Donnell of Manchester became the best known. His board immediately proved the usefulness of running on the Beeb – he was able to do what no other UK bulletin board could before: send colour graphics to callers at 300 baud!

Bulletin boards have been active in the UK for more than four years. Thus users wanting to set up with a BBC can benefit from the wealth of experience already built up. Sadly, though, the



Menu page of Robert O'Donnell's OBBS, possibly the first bulletin board for the Beeb

golden rules of running a board still have to be learnt the hard way. Anyone smitten with the bulletin board bug soon finds that a separate line for the board is a must. It's no use publishing limited hours of use and not expect people to call in the middle of the night. Next, another machine becomes essential because the original one will be devoted entirely to the board. Finally, be prepared to lose masses of spare time. Keeping the board from crashing and reading the messages is time-consuming enough, but even more time is required if improvements are to be made.

Sysops (short for system operators) have already had a few brushes with the law. So it makes sense for a budding sysop to consider some of the legal aspects of setting up a board before looking at available software.

Legal aspects

Various legal traps await the unwary bulletin board operator. The main one is the question of allowing obscene material to be transmitted over the public telephone system. This is banned by the Telecommnications Act 1984. Obscenities sent electronically would fall foul of this law just as if they had been spoken.

To discourage those who leave filthy messages, it is wise not to let first-time callers leave public messages. Boards that demand a password before allowing the caller to proceed further into the board are the best defence. Some boards – unfortunately no BBC systems yet – ask the caller to fill in a questionnaire before menus are presented.

Sysops should at least demand the caller's telephone number before upgrading. In the event of a complaint about obscene messages, the offender can then be given a strong warning. These procedures should protect the sysop but there's no cast-iron guarantee of freedom from prosecution. All on-line systems have suffered from obscene messages, however, so you won't be setting any precedents.

A bulletin board is also a form of publishing enterprise, so copyright and libel laws will apply. There is little one can do about the latter (apart from taking the drastic step of insuring yourself). However, being seen to actively discourage offences in both areas is the best policy.

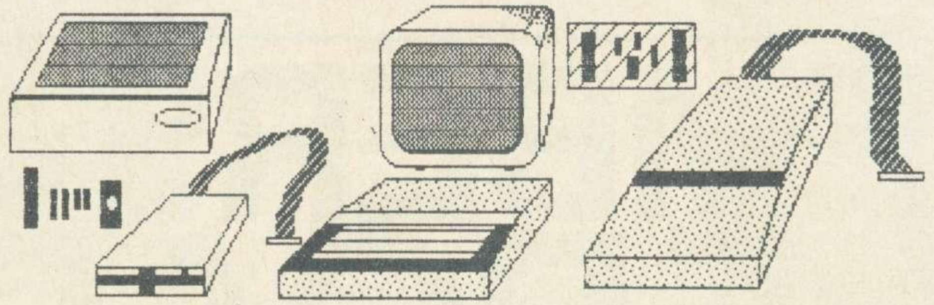
In one instance, a young enthusiast uploaded a simple routine for breaking the software protection on the Spectrum game *Jet Set Willy.* It was removed before more than three people saw it, but the incident heightens the need for vigilence. In the US a case against a one sysop for allegedly publishing people's credit card numbers was dropped when it was proved he was innocent of their existence on his board. The same defence could apply in the UK.

You also need to guard against software piracy by allowing callers to upload programs that only the sysop can see. Let subscribers download them only when it is certain the programs are in the public domain (the copyright has been waived). Otherwise, the unfortunate sysop could be caught with an unprotected version of *Elite* sitting in the download section! It would be the sysop rather than the mischevious uploader who would be in trouble.

Hackers' sections are very popular,

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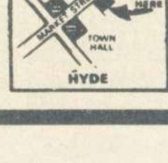
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but the sysop could be on very dangerous ground here. Callers are always leaving new numbers to try. Most of these are genuine but be suspicious of numbers that come with two passwords, especially if they are not something like 4444444444 or 'public'. It is not unknown for irate data processing managers to call up and threaten to sue for disclosing a means of access to their system. They may bring charges of theft of computer time or theft of electricity. In the US the law of trespass has even been used.

The police won't be too happy with a dyslexic sysop who publishes wrong numbers for 24-hour bulletin boards. It happens to the best of us, but try to be careful.

One last problem area: watch the userlog (the file that stores callers' details) very carefully. Many beginners actually upload their Prestel IDs and passwords at their first attempt to log on. They could then accuse the sysop of running up their bills on Prestel!



Menu of Marcus Anselm's FBBS. The software was written by Anselm and costs £10

Choosing software

Currently three systems are available commercially: FBBS for £10, NBBS for £50 and OBBS, which Pace is launching at £21 (plus VAT). There is nothing in the public domain for the BBC at present. Don't buy a system merely because it's the cheapest. The more editing facilities the software has the easier it is for the sysop.

The bulletin board programs reviewed were all very similar. Most have borrowed heavily from TBBS, an American program for Tandys. This means that experienced callers have very little difficulty finding their way around the system. I did not like OBBS's method – borrowed from CBBS – of giving a full menu only if a '?' is input. This tends to put off beginners.

The specification of virtually all the software described here is bound to change. Thus, the buyer could do no better than to call up at least one of each (see *Six Systems* panel) and nose around. However, those who wish to save on their phone bills should ensure that the software they buy supports colour graphics (mode 7) and can be operated at both 1200/75 and 300/300. The OBBS, FBBS and NBBS systems do exactly this.

Speed can be deceptive. OBBS appears to be slow on response time, but it has to cope with storing far more users and messages than the newer

SIX SYSTEMS – summary of hardware and software

SBBS – Simon Talbot at Watford

This system is running on a BBC model B fitted with a Watford DFS 1.4 and a dual double-sided Teac 40-track drive, giving about 400k of storage. The modem used is Simon's own experimental modem with a prototype auto-answer board fitted. In addition he has installed a Beebugsoft *Toolkit* ROM to give a few extra features. Simon also wrote the software.

Robert O'Donnell at OBBS 1 Manchester

This system is running on a BBC model B fitted with an Acorn DNFS 1.20 and a dual double-sided Mitsubishi 80-track drive, giving about 800k of storage. The modem used is a Pace Nightingale with a prototype auto-answer board fitted. In addition Robert has installed a Beebugsoft *Toolkit* ROM to give a few extra features.

The software was written by Robert, and will be available from Pace, along with the auto-answer/dial board for the Nightingale.

Cambridge Computer Board

Steve Potter uses a BBC model B with Acorn DFS 0.9 or Watford DFS. He uses 80-track, double-sided disc drives. No auto-answer modem used at present. Steve wrote the software, which is not yet commercially available. Minimum storage space required is 100k.

Jon Freeman's NBBS Systems

This bulletin board is run on a BBC model B with dual double-sided, 80-track disc drives. The modem Jon uses is a Telecom 2B, purchased from Display Electronics. The NBBS software is obtainable from Jon at £50, which includes utility programs and documentation. To operate it needs a BBC model B with at least one disc drive of 800k capacity, a modem (auto-answer or manually operated), Acorn DFS and Basic 2 ROMs.

Marcus Anselm's FBBS

This bulletin board is run on a BBC (32k), and the disc drives are Opus 800k, dual double-sided, 40/80-track. The printer is a Epson FX80 and the modem a Pace Nightingale plus auto-answer board. The bulletin board software is FBBS and costs £10.

The software was written by Marcus Anselm, with help from a few people (for the machine code). The package includes all the necessary discs plus an extra one with Sysop editing features. There are also instructions that list all variables, procedures, all files accessed and for what purpose, and procedures for creating menus, Sigs, etc. Contact Marcus by leaving a message on his Prestel mailbox no: 919993304. At the time of writing Marcus was still putting the final touches to the instructions.

Alec Crawford's NOBBS system

This system is run on a BBC model B fitted with an Amcom DFS and dual double-sided Cumana 80-track disc drive, giving about 800k of disc storage. At the moment the board uses a WS2000 modem fitted with an auto-answer board that doesn't work too well. Alec has a Epson FX80 printer connected, enabling him to keep a record of who has been on the board.

STARTING A BOARD: estimated cost

Bulletin board software	£10-£50
Wordprocessor	£32
Auto-answer modem (Telemod 3)	£140
BBC micro with Acorn DFS	£435
80-track single disc drive	£155
Floppy discs (packet of 10)	£20
Printer (Epson RX-80)	£250
Installation of extra BT line	£75 (max)
BT line rental per quarter (no phone)	£13
TOTAL	£1130 to £1170

All prices include VAT

boards. It's the drawback of being a pioneer! Nevertheless, the best programs allow the caller to interrupt a menu with a selection before the complete menu has been sent. This can save considerable time on-line, but the same effect can be achieved by the provision of an 'expert' facility so that regular users see only abbreviated versions of the menus.

Ideally, a test of the software would have provided an accurate comparison. Unfortunately, the Pace ROM was not available in time. In any event, both Jon Freeman and Marcus Anselm are still making improvements. When it comes to making a decision, it will be a toss-up between the system with most boards and the one that allows the greatest flexibility (ie, the most menus).

Hardware requirements

As mentioned, the board will occupy one micro completely so a sysop needs two. This prevents the board going off-line every time changes are needed. Thus the price of a model B with DFS is included in the costings.

Next, you need a modem. To begin with the operator can get away with manually switching the modem on when requested, but he will very quickly tire of this. So an auto-answer modem is a must. At the time of writing both the Pace and WS2000 auto-answer boards were yet to be approved by BABT. Thus the cheapest approved models are still the Interlekt Portman, Master Systems 2123 and Telemod 3. However, the ambitious sysop could go for the auto-baud sensing models from Dacom, Steebek and Tandata, which cost around £300. This would enable the baud to accept both 300 and 1200/75 baud callers.

A practical bulletin board will need at least 400k of disc storage space. This translates to something like an 80-track, double-sided disc drive or two 40-track drives. A board will be very hard to run without a printer – for messages, orders, listing the userlog, and so on. Epsons are very popular.

A wordprocessing package such as *Wordwise* or *View* would also save the sysop a great deal of time, although it's not entirely necessary. Less essential is some form of toolkit such as Beebugsoft's, since it applies only to those sysops who want to make their own subtle changes to the software.

That just leaves the cost of an extra line. The installation cost depends very much on how much extra work is involved. BT quoted a maximum charge of £75 but if the wiring already exists it will be much cheaper. Incidentally, the quarterly charge need only be for the line – £11.35 plus VAT – since the handset itself is superfluous!

```
Wednesday 1 May 1985  14:59:20


Welcome to NBBS East
--------------------

Running 24 Hours a day on 0692 630186
300 baud, 8 bits, no parity, 1 stop bit
Your System Operator is Jon Freeman


First Name? TONY
Last name? DENNIS

Calling from LONDON
Is this correct? Y

Enter your password : *****



Last time on was 29/04/85 23:32:24
Last msg on your last call was 696
Current last message is 706
You have called this system 1
times before.
You are caller number 1090
You are authorized 20 minutes
this call.

Active Combined Boards are :

BBC
Modem Spot
Adventure
Jokes
Sales and wants
Prestel
Commodore 64
Solidisc


Searching Message Base....
```

Beginning of a typical log-in to NBBS

If you've got all necessary equipment already, starting a board could mean just £10 for the software and £13 per quarter. Remember, the one good thing about running your own board is that everyone phones *you*. It does wonders for your own telephone bill.

PHONE NUMBERS

SBBS system
Main: Simon Talbot of SBBS Watford, (0923) 676644. After 9pm until 8am.

NBBS system
Main: Jon Freeman of NBBS East (Horning, Norfolk), (0692) 630186. 24 hours.
Satellites: Martin Newham of Mitcham, (01) 648 0018.

OBBS system
Main: Robert O'Donnell of Manchester, (061) 427 1596.
Satellite: Paul Roberts of North Wales, (0244) 549336.

FBBS system
Main: Marcus Anselm of Marctel, London, (01) 346 7150. 10am to 10pm.

Cambridge CB
Main: Steve Potter, (07677) 7792. 9pm to 10pm.

NOBBS system
Main: Alec Crawford, (0295) 720812. 6pm to 7pm.

◀ *Continued from page 149*

The host software gives you six options. First an in-tray has to be set up on a disc. This is a multi-frame database which records details of callers, the frames they have viewed, messages sent by them and any viewdata frames they have sent. The second starts the system running as a host. With the correct discs in place, including a database with four special pages – a hello page which collects information about the user, a message page, an index page and a 'bye' page for logging-off – the system will go on-line. It will report any of the missing pages, and also detect and report if the modem is connected to the micro. After the time of day has been set, the host is on-line waiting for callers. When a call is received, the 'hello' page is displayed which asks for a user's name and number. This information is recorded on the in-tray along with details of things looked at. The next three options allow for the review, display and editing of the in-tray. The final option returns to the main menu, in good viewdata style.

Terminal software is also supplied in the level two system. This makes use of the modem's auto-dial facility. Apart from the ability to use an on-line editor like Hey Presto to generate and send frames to Prestel, it's almost identical to the one supplied by Micronet – in fact it is written by the same people. An additional feature allows frames to be sent to other Communitel systems at 1200 baud. Finally, if you want hard copy of any pages, the system supports a number of printers including the Integrex colour model. A special printing option is offered from the master menu but this can be called from many other parts of the software suite.

To conclude, the Communitel package offers an excellent Prestel emulator. It's a must for anybody interested in electronic publishing for it offers a complete editing and communications system at a very reasonable price. The level one system without the modem and communications software should prove very popular in schools at £49. The Hey Presto Editor is the best I have yet to see.

What about community groups and the like? Well it's still expensive to receive the information. The cheapest system comes in at around £150, so I feel that for the time being, the only users will be those already converted. Of course it's possible to get a terminal running that's shared in a group, and that could prove very useful. However these groups use it, viewdata will undoubtedly become more widespread in its use, and the more people who understand the medium, the better.

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5402D	335.00
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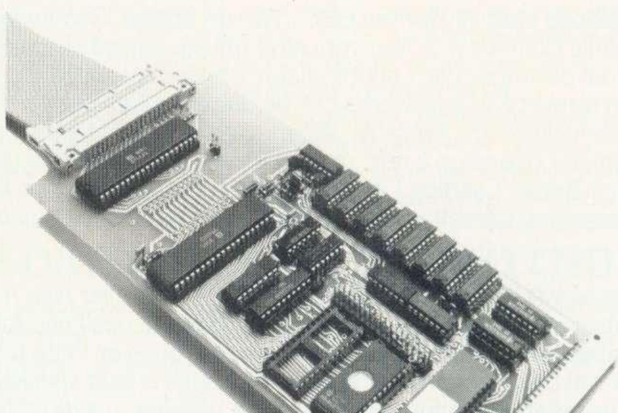
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MOVE INTO MODEMS

A rundown of the hardware and software

by Jeff Ashurst

TO ENABLE your micro to communicate via the Public Switched Telephone Network (PSTN) you will need a modem and some terminal software. The modem converts the micro's digital signals into frequencies which can be sent down a telephone line and carries out the reverse process on received data: it MOdulates and DEModulates, hence the name modem.

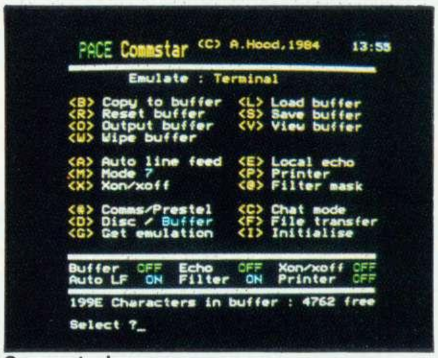
Modems come in many shapes and sizes with varying degrees of sophistication and price tags. Despite this, however, modems designed for personal or home use all operate around a small number of communications protocols. The V21 protocol defines 300 bits per second (b/s) full duplex (both directions simultaneously) communication. This is useful for user-to-user contact and has been adopted by almost all UK bulletin board operators. V23, on the other hand, is probably used by more people because it embodies the 1200 b/s receive, 75 b/s send speeds of the Prestel database. In shorthand, this is usually expressed as 1200Rx-75Tx. This standard also encompasses half duplex (one way at a time) at 600 and 1200 b/s.

You can buy an acoustic modem from around £60. These come in two types, either rigid mouldings or flexible with rubber cups. They connect to the phone line by clipping to the handset and use the audio tones to receive and send data.

A drawback is that data corruption through ambient noise could occur. This type of device is usually single standard in capability, though OEL make two versions, V21 and V23, of their PAC model. Good value is the Protek, offering 1200/75 and 1200 half duplex.

Moving up the price range to £85-£90 we come to hard-wired modems such as the OEL Telemod 2 (ie, it connects to the BT socket). This popular V23 unit has been supplied as part of the Micronet 800 package deal, and is marketed also under the Prism and Watford badges.

At approximately £115 comes Acorn's Prestel Adaptor, a sophisticated auto-dial modem which is fully software controlled. The comprehensive software comes on a ROM included in the package. This is probably the best value in V23 modems.



Commstar's menu screen

Once through the £130 barrier we come to the multi-standard modems – those devices which are switchable between several protocols. In this bracket are the Pace Nightingale and Loco Systems SCM-100 (reviewed in February '85), the Miracle Technology WS2000 (reviewed this month), the Interlekt Portman and its younger brother the Prospect, plus offerings from Modular Technology, Tandata and others. At this level things start to get really interesting, with manufacturers offering add-ons such as full software control, auto-dial and auto-answer (see the WS2000 review). In this field, Tandata's auto-dial TM200 is a notable contender in that it also has its own memory, maintained by an on-board alkaline battery. Telephone numbers, personal ID codes and passwords can all be stored, together with comments, to reduce the dial-up/log-on process to a single keystroke.

Most advanced modems like this use the serial link to the computer to carry control codes in addition to data in and out. This normally results in both hardware and software, having been designed for each other, being incompatible with those from other sources. You may not find this disadvantageous, but I prefer wider compatibility. One of the reasons why I have previously expressed enthusiasm for Pace's current products is that neither their modem nor their software needs or expects any special response codes, and therefore both are widely compatible with other software and hardware respectively.

Software control is best achieved via the user port, as is the case with the SCM-100 and the WS2000 modems, keeping the RS423 lines for data signals as intended. This said, however, I must admit that Acorn's Prestel Adaptor uses the RS423 link to very good effect as a software driven V23 modem. It is even possible with this package to download a blank message or greetings frame from Prestel, to compose and edit your own viewdata frame thereon while off-line and subsequently upload the result, keeping telephone time to the minimum.



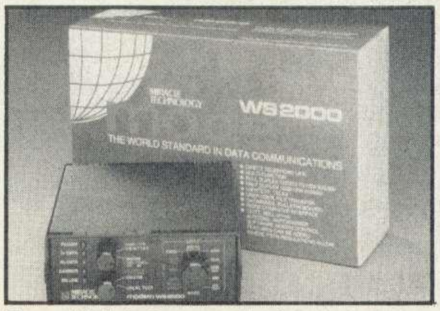
The Pace Nightingale, a multi-standard modem

'What should I buy?' people ask. Increasingly in personal computing – a pursuit steeped in 'logic' – it appears that the more logical first question 'what do I want to do?' can only be answered when all the possibilities are known – rather like not being able to learn to swim until you've jumped into the water. Well, for myself, with present knowledge and experience, I would go for a *Commstar* ROM (from Pace) for its flexibility and the ability to configure it from menus to access almost any host system, and mate this with a WS2000 modem, again not only for adaptability and range of protocols, but also for its extensive provisions for further enhancement.

In the near future I hope to bring you comparative reviews of possible competitors, perhaps one or more of the other top flight modems and, in firmware, the *Termi* and *Communicator* ROMs from Computer Concepts.

MIRACULOUS!

Jeff Ashurst tests the WS2000



Thoughtful design, excellent performance

THE WS2000 from Miracle Technology is a functional-looking unit measuring 155 × 160 × 68mm. The test model was a version 7 example, and had a beige ABS outer casing with front and rear panels in matt black. Modem controls and status indicators are mounted on the front panel, while at the rear are connection ports, power in, line out and an on/off switch. A Ring Equivalence Number (REN = 1) is quoted in accordance with current BT practice. This and other legends are marked clearly in white on the matt black surfaces.

User selection of operating mode of this multi-standard unit is by three rotary controls in the front panel. These allow selection between:

- 1200/75 V23 and 300/300 V21 speeds
- 300 full duplex orig/ans, 600 or 1200 half duplex
- on/off line

Each switch has duplicate function. The speed selector is also used in the '300' position when working at 600 or 1200 half duplex; the mode selector has a V23 test setting; and the off-line position doubles as the 'local test' setting for checking modem functions.

As the positional combinations in use are difficult to convey with clarity in words, Miracle Technology prefers to use a picture in its instruction manual. For each application described, a bold block diagram of the front panel is provided with switch settings shown clearly.

Before leaving the control area of the front panel, I must mention that around the mode selector are marked, in a less prominent red, the positions for selection of Bell frequencies, although these are not used in the green sticker units approved for connection to BT apparatus. For use with non-BT systems, the modem can be modified to operate on both CCITT & Bell frequencies. (No multi-standard modem has been awarded the BABT seal of approval with its Bell options operable.)

To the left of the front panel is the status area, with five red LED indicators marked, from top to bottom: Power, Tx Data, Rx Data, Carrier and On Line.

Study of the business end (the rear panel) reveals just what a serious piece of equipment this is.

Pin no.	Signal
1	Protective ground
2	Transmitted data
3	Received data
4	Request to send
5	Clear to send
6	Data set ready
7	Signal ground (Common return)
8	Data carrier detector
20	Data terminal ready
22	Ring indicator

Table 1. RS232 wiring for the D connector

The serial interface employs a 25-pin D connector with 10 pins wired according to standard RS232 recommendations (table 1). Of these signals, the 5-pin DIN port of the BBC micro's RS423 interface handles pin numbers 1, 2, 3, 5 and 7.

Alongside the serial port is a 20-pin user port, through which the modem can be operated under software control when the appropriate hardware extensions are fitted. A software control kit, an auto-dial kit and an auto-answer board are available. In addition, provision is made for a TTL port to be added to the panel to enable unspeakable things like the Commodore 64/Vic20 to be interfaced to the WS2000. With this extension fitted, two devices can be connected to the modem simultaneously.

Finally, an accessory port in the form of a 5-pin DIN socket sits to the left of the array. This is for future expansions, said to include a battery back-up pack and an acoustic coupler.

A nice touch, and one which I feel is indicative of the obvious thought and attention to detail in this design, is that each port has the first and last pins numbered as part of the legend.

In use, the WS2000 lived up to the expectations that the casing and manual had generated. I found it useful to have the bank of status LEDs, either to confirm that things were happening as they should or, more importantly, as an aid to fault-finding – like when a wire pulled off my RS423 DIN plug.

Altogether an excellent modem. The WS2000 I tested was the standard manual version, but my appetite is now whetted to try a software controlled, auto-dial and auto-answer example of the same machine.

	SCM	Night'ale	Telemod	Prestel	Protek	PAC	WS2000
Price including VAT	£149.95	£136.85	£84.95	£113.85	£59.95	£99.95	£149.45
BT green sticker	★	●	●	●	●	●	●
protocols: CCITT V21 (BTG)	●	●					●
CCITT V23 (Prestel)	●	●	●	●	●	●	●
reverse V23		●					●
1200 half-duplex	●		●		●		●
600 half-duplex							●
Bell	●	●					●
originate and answer modes	●	●	●		●		●
self test	●	●	●				●
auto-dial	●	E		●			E
auto-answer	●	E					E
telephone socket	●	●	●				●
sized to telephone	●	●	●				
on/off switch				●	●		●

E: optional extras *★BT approval applied for*

Table 2. The facilities offered by each modem

	SCM	Night'ale	Telemod	Prestel	Protek	PAC	WS2000
ease of use	4	8	7	8	5	7	7
documentation	7	6	5	9	4	3	6
range of protocols	8	8	4	2	4	2	9
range of features	8	4	4	4	—	—	9
overall useability	5	6	6	7	5	5	7
overall rating	32	32	26	30	18/40 × 2	17/40 × 2	38

Table 3. How they score out of a possible 50 points (acoustic couplers out of 40)

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5)	Holds	— approx 1200 ADDRESS records per 100k.
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★ TRANSFER—Records from one file to another.
★ SEARCH LISTS—Allow creation of sub Databases within main Database.
★ GLOBAL ENTRY—provides easy entry of repetitive data and a powerful global edit/update facility that will save hours of typing.
★ SPOOLER—enables you to create spooled files that are compatible with Wordwise, View and other word processors. The spooler program will allow you to format your spooled file in the same way as the powerful printout option. You can therefore have headings, columns, titles, numbers etc.
★ INPUT—is a routine included on the disc which will allow you to write your own utilities for accessing your data. Many of the programs on the coming utilities disc were written using this procedure.
★ TUBE—compatible with the 6502 second processor.
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The original REPLICA set a very high standard so the specification that we set our chief programmer presented him with a real challenge. In fact REPLICA II is now 2 separate programs, one for DFS using the 8271 controller and the other for the various DDFS that fully implement OSWORD &7F. REPLICA II will transfer many of your cassette based programs to disc, even more than REPLICA did. Now when you buy disc drives you do not have to throw away your expensive cassette based programs.

REPLICA II transfers 'LOCKED' programs, programs loading as files, programs that load below &E00, those with up to 9 sections and those up to &6E in length e.g. adventure programs. No more waiting for 6 minutes whilst your adventure programs load.

REPLICA II is very easy to use and the user just enters a name, how many sections and whether CHAIN, *RUN or *LOAD is used to load the first section. Press play and let the program do the rest, even a menu. Just think how much it will cost you to buy a disc version of your favourite program—it is probably more than REPLICA II, which will hold up to 16 programs, limited only by the disc capacity and catalogue.

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This is the first module in an integrated accounting suite of programs written to be used and not simply to please an accountant. This module contains an INVOICE and DELIVERY NOTE program with 80 column input and screen editing, you see what will be printed before committing yourself. Account customer details are inserted automatically and delivery notes generated automatically when required. Customer details without account numbers can be automatically placed in a Beta-Base compatible file for use as a mailing list.

A sales ledger sheet is printed automatically when there is enough data to fill a page, alternatively the user can print the ledger sheet before a full page to suit his needs. VAT details are generated at the end of the VAT period and the year to date figures can be viewed at any time. Provision is made for multiple VAT rates including standard, zero, export and exempt.

A transaction file is generated for account customers for use with the STATEMENTS and ACCOUNTS RECEIVABLE module.

Future modules will be STATEMENT and ACCOUNTS RECEIVABLE, STOCK CONTROL, ACCOUNTS PAYABLE and NOMINAL LEDGER. All relative files are compatible with CLARES Beta-Base which can be used to manipulate the files as required. A Beta-Base Utilities Disc will soon be available and will provide Mail-Merge facilities and links into ULTRACALC plus many other features.

★ INTEGRATED ACCOUNTS and DATABASE
★ MULTIPLE VAT rates
★ SCREEN EDITING with insert & overwrite
★ AUTOMATIC DELIVERY NOTES
★ INVOICE COMMENTS
★ ACCOUNT HOLDERS details inserted automatically
★ MAILING LIST generated automatically
★ LEDGER SHEET printed automatically
★ VAT sales returns prepared
★ TRANSACTION FILE generated
★ Beta-Base compatible

This program was written for our own use and is used to prepare hundreds of invoices per week. It has no unnecessary questions or keys to press and extensive but easy edit options, we have made life as easy as possible for ourselves so why not take advantage of our efforts.

Requires double sided single or twin single sided drives for minimum configuration –no stock control or customer database. Double sided twin drives will enable a full integrated system to be used.

FUN HOUSE £10.00

40 80 3"

FUN HOUSE is a highly original suite of educational programs suitable for ages 3 to 13. The program is designed to encourage children to spell words which relate to objects found around the home. Animation and music are used to good effect and some highly original ideas are incorporated. Each room exercise is terminated with a warning item e.g. the lounge finishes with 'FIRE' which goes on to engulf the whole lounge. Tests with a newly hired 4 year old resulted in us having to prise him away from the keyboard after 2 hours. In that time he had gone from never having used a keyboard to finding the location of all the keys very quickly and entering the correct answer. He had thus started on the path to learning spelling and familiarised himself with the keyboard including the use of DELETE to correct his mistakes. Can you afford not to give your children the same start?

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Closely related to the EDITOR is the EXTENDED ERROR HANDLING which will trap errors in a program and enter the EDITOR at the line generating the error, not only that but it will also position the cursor as near to the statement causing the error as possible, no more wading through multi statement lines trying to identify the error.

Commands unique to BROM are:

ROMON & ROMOFF which enable you to turn on/off sideways ROMs so that they stay off even after CTRL/BREAK, very useful for avoiding clashes especially for users with second processors. This also works with the DFS and reverts to PAGE &E00 automatically.

CASE which forces input into upper or lower case irrespective of caps/shift lock.

FLIST which lists a program one statement to a line but more importantly it will even list 'BAD PROGRAMS.'

ONEKEY is a single key entry option but you can also define your own strings to any ASCII key, just like an extra 48 function keys.

Another group of commands provide FIND and selective or global SEARCH and REPLACE facilities. These commands work with strings and keywords or a mixture of both e.g. "*FIND PROChelp T", will list the full line containing PROChelp, the 'T' simply tokenizes any keywords.

Yet another group of commands allow lines to be moved or copied to a new location.

The other commands provide function key editor, 'BAD PROGRAM' cure, variable lister, integer variable flush, program compacter etc.

This is a genuinely useful ROM that no user should be without. Be warned, once used you will not be able to live without it!

"...this is the best On-Screen BASIC Editor I have ever used; it is far superior to BEEBUG softs Toolkit."

Viewfax Tubelink

The Brom disc is suitable for use with SOLIDISK SIDEWAYS RAM.

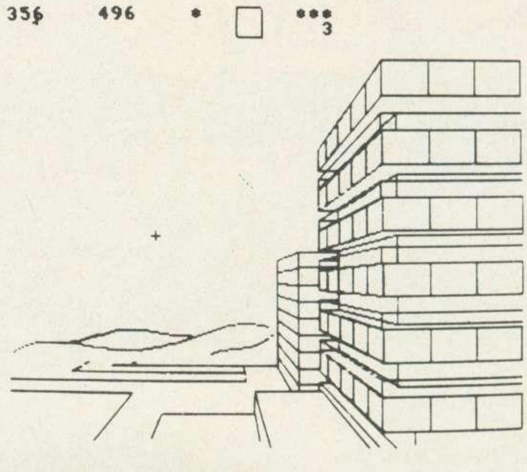


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[EPROM]	EPROM

UNLESS STATED ALL DISCS COMPATIBLE WITH ACORN, WATFORD 1.3, AMCOM, UDM 2.0, OPUS 3.45 AND CUMANA QFS. PLEASE RING FOR COMPATIBILITY WITH OTHER DFS.

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Change any actual colour for one of 8 others
Clear screen, load screen, save screen
Print characters or numbers at any pixel point
Error messages for incorrect input
Fully comprehensive manual



designs

This programme has been purpose designed by professional Graphic Designers for simplicity and ease of use, and is undoubtedly the most versatile drawing programme on the market at this time. There is no need to input any numerical data, as all judgements are made visually. The BBC Micro is the finest drawing machine in its price range. Find out what it can do.

The A. B. Designs drawing programme costs only £36 for over 70 functions (model B). New AB2 Program, available on disc (price £61) and cassette (price £51). When ordering send Cheque/PO and VAT at 15%. Please include phone no. with all correspondence. For further information send SAE and phone no. to A. B. Designs, 81 Sutton Common Road, Sutton, Surrey. 01.644 6643 (closed all day Thursday).

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6 Displays basic variables

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IN ROM SOFTWARE

INTER-CHART
THE CHART & GRAPH PLOTTING ROM

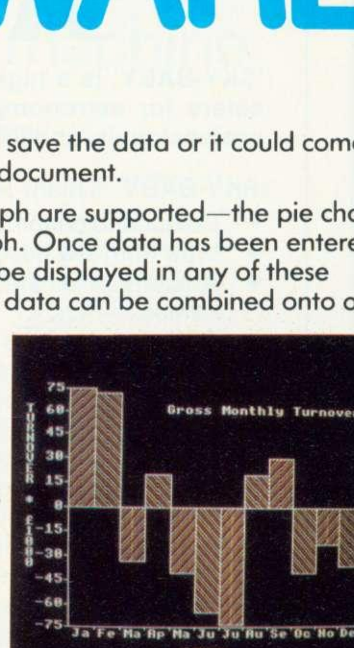
This ROM-LINK compatible program allows practically any data to be presented in graphic form.

Rows of figures are always difficult to digest, but when displayed as graphs even the most complex data becomes understandable. This program will cope with just about any sort of numerical data. At its simplest level a string of numbers can be entered at the keyboard, and a graph will be plotted.

Because this is a ROM-LINK compatible product it can read data from any other ROM-LINK program. It is especially tailored to INTER-SHEET and so can very easily use spreadsheet data for plotting charts and graphs.

Data can be input to the program from 3 distinct sources. Firstly directly from ROM-LINK compatible packages as described above, secondly, from the keyboard so that data can be manually typed in and thirdly from file. This last option gives almost endless possibilities. For example a BASIC program could save the data or it could come from a word processed document.

Three basic types of graph are supported—the pie chart, bar graph and line graph. Once data has been entered into the program it can be displayed in any of these formats. Multiple sets of data can be combined onto one graph for comparison.

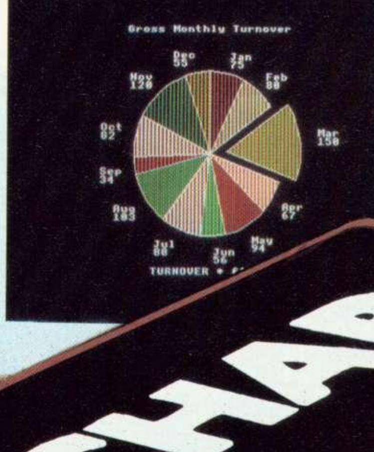


This program supports a full range of mathematical functions, and allows data to include complex mathematical or scientific expressions.

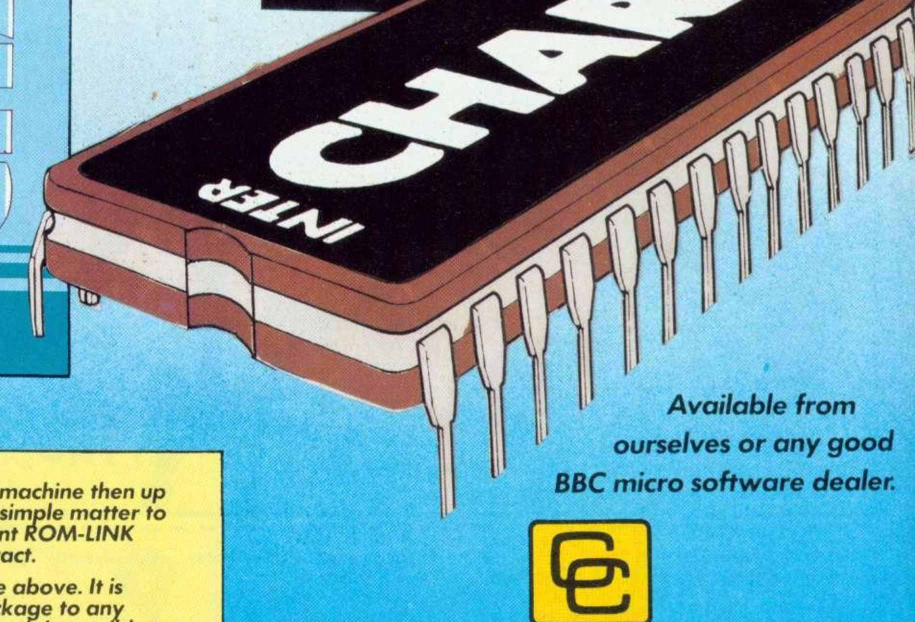
Because it is completely auto-scaling there is no need to worry about how many numbers are entered, nor about their range.

Routines are included for dumping the graphs to EPSON compatible printers, and provision is made to allow dumps to other types of printers.

£38 + **£1 p&p** + **VAT** (**£44.85**)







Available from ourselves or any good BBC micro software dealer.

With only one ROM-LINK compatible ROM in the machine then up to 16 sets of data can be held for this ROM. It is a simple matter to switch between sets of data or completely different ROM-LINK programs, and all the data remains in memory intact.

The second advantage leads naturally on from the above. It is possible to transfer data from any ROM-LINK package to any other. If only INTER-SHEET is present in the machine, it is possible to transfer data between separate worksheets. If more than one ROM-LINK package is present then data can be transferred between any of these. This data transfer is direct in memory, and does not require the saving of data to disc.

The first two ROM-LINK compatible packages are INTER-SHEET and INTER-CHART. It is hoped that others will be available later in the year.

ROM-LINK

Computer Concepts
Gaddesden Place, Hemel Hempstead, Herts HP2 6EX
Telephone: Hemel Hempstead (0442) 63933

NEW CONCEPTS

INTER SHEET
THE ELECTRONIC SPREADSHEET ROMS

Spreadsheet programs have become one of the most popular micro-computer applications in recent years. They can be thought of as a totally general purpose numeric tool, of use to anyone who has to handle figures, calculate costings, keep control of running costs, or just simple budgeting.

This package contains the ROMs, a quick reference card, an introductory manual to spreadsheets and a comprehensive reference manual. Chip fitting instructions and a function key strip are also included.

The program has many quite unique features.

1 40, 80 or 105 column screen display. The special 105 character screen mode displays more than any other spreadsheet.

2 Up to 16 spreadsheets may be stored in memory at once.

3 Data can be transferred from one spreadsheet to another.

4 Spreadsheet data can be transferred to and from popular wordprocessors such as WORDWISE and VIEW.

5 This package will integrate directly with other ROM-LINK compatible products, such as INTER-CHART, which can produce charts and graphs of data from the sheet.

6 Formulae in boxes are tokenised to save space. This means larger than normal spreadsheets can be accommodated.

7 Main menu enables even the inexperienced user to operate the more complex functions. There is no need to remember long command names.

8 Extensive built-in help menus

These are in addition to many other powerful features such as: Variable column widths. Flexible replication facilities. Insert and delete rows and columns. Numbers may be printed in three formats. The number of decimal places is variable from 0 (integer) to 9. Locking/unlocking of boxes. Boxes may be justified left or right for numbers and left, centre or right for labels.

Most of the above features can affect individual boxes, rows, columns or the entire sheet.

INTER-SHEET supports a large range of high precision mathematical functions. These include all the more common functions such as SIN, SQR, TAN etc. but also include special sheet functions like SUM, MAX, MIN, LOOKUP, AVERAGE.

A special form of windowing has been included allowing any row or column to be held on screen as the sheet scrolls underneath.

All in all these features go to make INTER-SHEET the most powerful and flexible ROM based spreadsheet available for the BBC Micro-computer.

£48 + £1 p&p + VAT (£56.35)





ROM LINK

This is a new system devised especially to take advantage of the BBC Micro's unique ROM handling capabilities. A series of application ROMs will be produced that can, when used together, form a truly integrated suite of programs.

The packages can, of course, be used on their own and do not require other ROM-LINK packages to be installed.

The ROM-LINK system offers two great advantages. Firstly it allows up to 16 separate programs to have data in memory at any one time. This could be data from any ROM-LINK compatible program, and so eventually it will be possible to have, for example, a couple of documents being word-processed, a few spreadsheets, and a set of data for plotting graphs.

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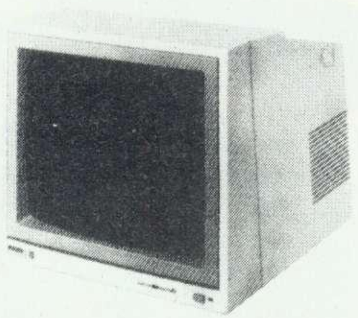
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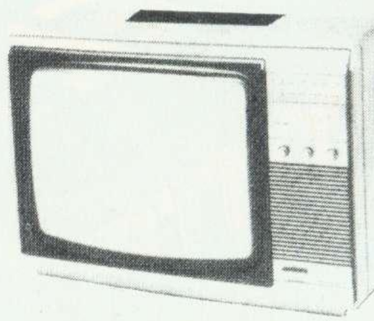
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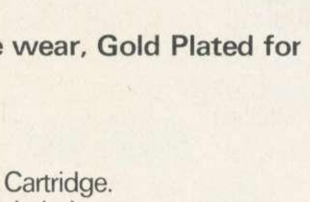
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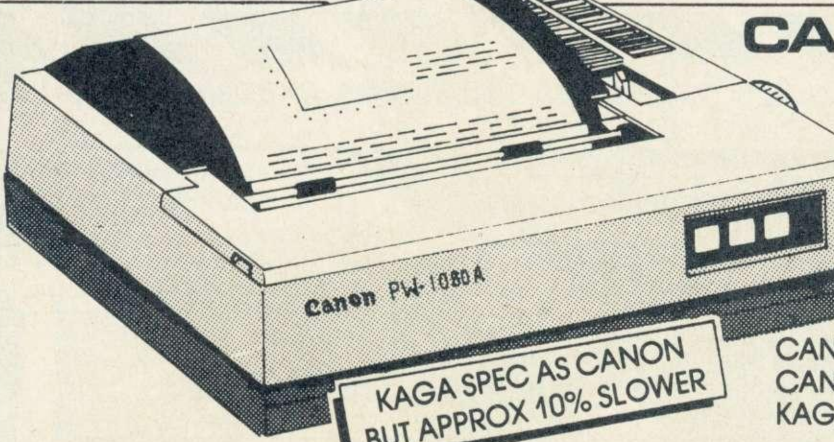
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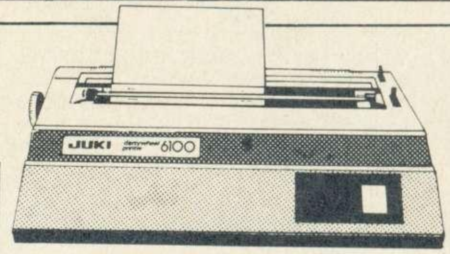
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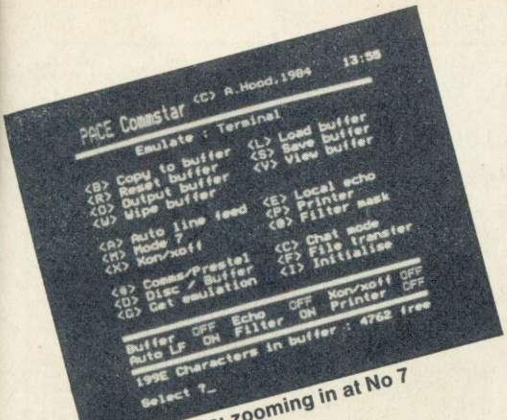
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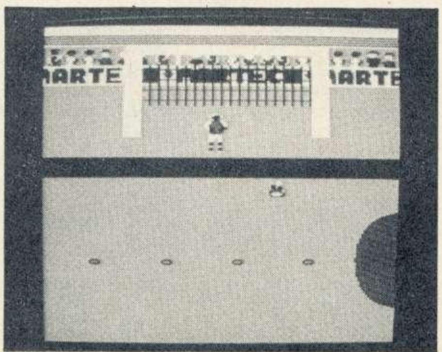
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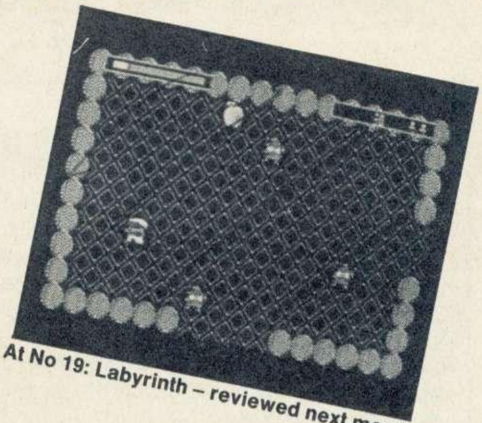
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Revs: zooming in at No 7



Brian Jacks Superstar: still scoring



At No 19: Labyrinth – reviewed next month

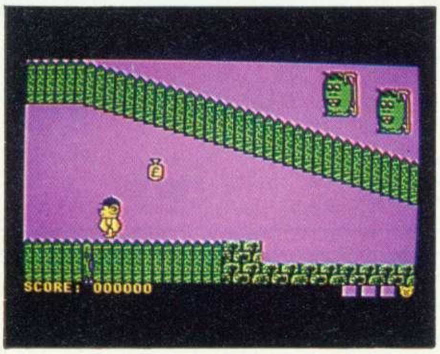
GAMES TOP 20

	TITLE	PUBLISHER	PRICE	MICRO	REVIEWED
1 (-)	Knightlore	Ultimate	£9.95	B	
2 (-)	Alien 8	Ultimate	£9.95	B	
3 (-)	Atic Atac	Ultimate	£7.95	B	
4 (5)	Wizardore	Imagine	£7.95	B	August '85
5 (3)	Elite	Acornsoft	£14.95 (£17.95)	B/E	October '84
6 (-)	Magic Mushrooms	Acornsoft	£12.95 (£14.95)	B/E	May '85
7 (-)	Revs	Acornsoft	£14.95	B	July '85
8 (4)	Combat Lynx	Durell	£8.95	B/E	
9 (1)	Brian Jacks Superstar	Durell	£7.95	B/E	August '85
10 (6)	Gremlins	Adventure Intl	£7.95	B/E	
11 (2)	Castle Quest	Micro Power	£12.95 (£14.95)	B	March '85
12 (7)	Tempest	Superior	£9.95 (£11.95)	B/E	
13 (8)	Football Manager	Addictive	£7.95	B/E	March '85
14 (13)	Blockbusters	Macsen	£7.95	B/E	
15 (11)	Pole Position	Atarisoft	£9.99	B	February '85
16 (12)	Frak!	Aardvark	£7.50	B	September '84
17 (-)	Hampstead	Melbourne	£6.95	B/E	
18 (15)	Tales of Arabian Knights	Interceptor	£6	B	
19 (10)	Labyrinth	Acornsoft	£9.95 (£11.50)	B/E	
20 (20)	Hunchback	Ocean	£6.90	B/E	December '84

B = BBC. E = Electron. Prices in brackets are for disc versions. Compiled by RAM/Computer.

Follow the bear

'Banjax', Robico Software, 3 Fairland Close, Llantrisant, Mid Glamorgan, tel: (0443) 227354, BBC B, £9.95 (cassette)



THIS IS a smashing game. An adventure with graphics. It makes life much easier for stumblebums like me because I can at least see where I'm going even if I don't know where it's leading me. I say me, but it's really Banjax the bear who's doing the stuff. Looks very like Rupert with no trousers on, not that I've ever seen Rupert with no trousers on, you understand. It's how I imagine he would look debagged.

Essentially, you have to do the usual thing of collecting together all the bits of treasure and presenting yourself at the appointed place. This isn't as easy as it sounds because you have to follow a certain sequence, which is not vouchsafed to you. There is also a tricky bit at the start which Robico don't tell you about, but they do tell reviewers. Ha ha, power at last!

Robico have used a cut-down screen for the graphics, which are very good if not spectacular. The whole thing is a maze, certain sections of which can only be entered if you have amassed enough points. Thingies are trying to bite your neck while you roam. See, it's got me thinking I'm a bagless bear. I'm not, honest. Am I?

Unlike some text adventures, the maze is logical – ie, if you go north and then south you finish up where you started, so mapping is fairly easy. An adventurer's notebook is supplied with the program to keep your maps in. Also supplied is a help card to send back to Robico should you get lost. It would be nice to say I didn't need help but I have to confess that I did make a phone call to Robico who, as ever, were kind enough to point me in the right direction.

My sister is lost in the maze but I won't help her. Absolute power corrupts absolutely.

I enjoyed the game very much and it kept the whole family entertained and bemused for a lot longer than I care to admit. The only moan I can raise is that it's not possible to save your position, but that's a small price to pay. Great stuff.

Rupert, who's Rupert?

Harry Sinclair

Strong fingers

'Brian Jacks Superstar Challenge', Martech (tel: 0323 768456), BBC B and Electron, £7.95

THE OBJECT of the game is to beat Brian Jacks (ex-world Judo champion) in a series of eight physically demanding events which will test your strength and stamina. This is great, as long as you want to build up muscles in your fingertips!

All eight events (swimming, canoeing, archery, cycling, 100 metres, squat thrusts, arm dips and football) involve the player challenging Brian Jacks.

The entry screen allows you to choose either keyboard or joysticks and whether to have sound effects. Using the keyboard can be a tiring experience for your fingers, though. The control keys vary according to the event, but generally the Z and X keys are used, usually to provide strength for your alter ego – fast, alternating pressure will increase your power.

After each event the screen returns to a title page that gives your present score against Jacks'. The screen doesn't tell you, though, what event comes next and as the key-hitting strategy changes for different events, you can be left feeling a bit bewildered.

The sound effects are limited and this seems to be an area that has been ignored. However, if you have the Acorn speech chip the BBC will speak, but not very well! This speech isn't mentioned anywhere in the package



and it's hardly surprising. The programmer has added, with minimal thought, a countdown (3-2-1) and about three other words. In the darts event for instance a hit on target produces the encouraging word 'good' from Kenneth Kendall. A miss, however, makes the machine emit 'must' – presumably the nearest word to 'miss'!

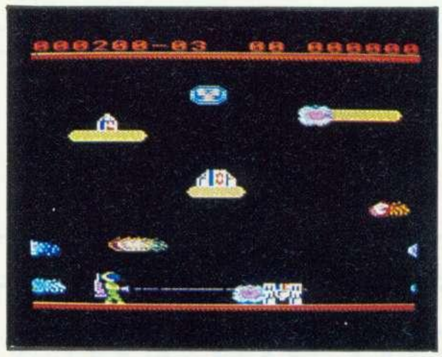
The graphics are reasonable, though not outstanding. There is a good sense of the athlete's movement in some of the events, especially the squat thrusts, but here more than any other event the keyboard movements are awkward and very tiring. If you have a higher score than Jacks after completing eight events, you go through to the next level to challenge him at the same events but at a greater level of difficulty.

The game held little interest for me and required no thought whatsoever. As for my fingers, they've never been so strong!

Jeremy Vine

Ultimate fun

'Jet-Pac', Ultimate (tel: 0530 411485), BBC, £7.95



YOUR task is to travel from planet to plant collecting the parts to build a rocket and fuelling it. Your only method of propulsion is the Jet Pac strapped to your back. Using Caps-Lock, CTRL, and Shift to thrust, you can fly around, collecting the rocket's stages, the fuel and bonus objects. Having completed your task, the rocket takes off and lands elsewhere, opening up the next scenario.

Each level brings different nasties, who are determined to stop you. On the first screen they are relatively harmless, but later they get vicious, with balloons, aircraft, amoebatrons and other such characters after your blood.

Jet-Pac has a good graphic display, most movement is very smooth, and the Defender-type laser rifle is quite convincing. Colour has been used to good effect, and the puffs of smoke that arise if anything is killed are also well done.

Sound is varied and effective, explosions abound and the take-off and landing sequences are particularly successful.

There are options for one and two players and joysticks may be used. Sound may be disabled, and there is a top-ten high score table as well.

Jet-Pac is fun to play, if not a little rapid at times.

Stuart Menges

Grandpa's dragon

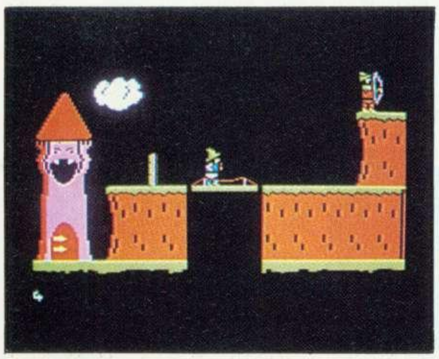
'Wizadore', Imagine/Ocean, tel: 061-832 6633, BBC B, £7.95 (cassette)

THIS IS an arcade adventure rather on the lines of *Castle Quest*, although there are no logic puzzles to solve in this one.

The story is that your Grandad was something of a wheel in the land of Wizadore – the Arch Mage in fact. Along came the great red dragon, Smaun (sounds Irish that, Smaun O'Flaherty the fire eater, flushed with the Guinness), and caused great havoc with his halitosis.

Passing the Clean Air Act did little to relieve the situation, so Gramps decided to get tough and created a golden sword with which to smite the fiery, great beast. Unfortunately, the champion who was to deal the deadly blow had started to believe his own publicity – you know, number one boy with the blade, take him in the third, that sort of stuff – and finished up with a severe case of heat stroke. The sword was broken into three pieces and strewn, as they say, to the winds.

Feeling a trifle world-weary, Grandpa went in for a bit of self-immolation, shuffling off the old mortal coil in the process. His magical castle took the



hump and withdrew its drawbridge, vowing to return it only when rosy Smaun was dead. Guess what? This is where you come in.

You have to find the three spells of destruction so that you can blat the various types of bewitched mortals who are trying to do you in. I presume that you have to reconstruct the sword, hold your nose, and let Smaun have it between the shoulder-blades. I say presume because I don't know. I keep pointing my toes skywards after about 90 seconds and even Rasputin, a changeling posing as one of my children, has been having a tough time. Prizes of £100 are being offered each month for those who can crack it, so it isn't easy.

The graphics are a mixture of excellent and pretty good. The characters and backgrounds are very good indeed – beautifully drawn and detailed, the best I've seen.

The characters in motion tend to be a wee bit flickery and the scrolling is not as good as *Castle Quest*, but then what is? On second thoughts, I'm being picky. A year ago I would have been doing backward somersaults on seeing graphics as good as this – it's just that the advances made in the use of the hardware since then do increase expectations.

An excellent game which I would unreservedly recommend, and don't forget, I've only seen a tenth of it. Don't expect to be collecting £100 though. Oh, it's hard.

Harry Sinclair

Colossal déjà vu?

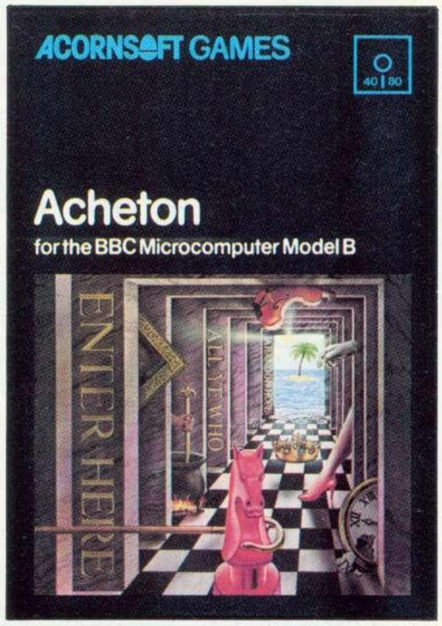
'Acheton', Acornsoft, BBC B, £14.95 (cassette), £17.65 (disc)

THIS is one of the latest pair of adventures from Acornsoft (the other is *Quondam*) billed as being for experienced adventurers for the BBC, though I doubt Acornsoft's claim that it is of a complexity previously found only on mainframe computers – the Infocom adventures are played on micros, after all. Perhaps it is the biggest so far for the BBC.

Regrettably, quality does not equal quantity in this case. The game has good, clear text layout, as it should do at the price. The beginning of the game is rather reminiscent of the classic *Colossal Cave* adventure. Unfortunately, the differences between *Acheton* and *Colossal* take the form of in jokes – in other words, traps that you may find amusing if you know *Colossal* well, but which otherwise will appear rather odd.

The main problem, however, is the similarity with those older adventures set in caves. I kept getting *déjà vu*, the feeling 'haven't I been here before?' There are just too many caves, all much the same, and not enough really tantalising problems. Where are the bizarre conundrums of *Philosopher's Quest*, the interlinked passages of *Castle of Riddles*, the mysterious messages of *Kingdom of Hamil?* Above all, where is the atmosphere that pervades adventures like *Gateway to Karos?* Not there. I have only seen a few score locations – less than a quarter of the total – but *Acheton* strikes me as *Colossal Adventure* rehashed, with a few amusing twists thrown in.

Some of these twists are worth mentioning. As in the classic, upon commiting some fatal folly you are informed of your total incompetence and asked if you wish to be reincarnated. Try ans-



wering 'no'. You find yourself in Hades, and have to find the way out! (This is not a difficult problem for an experienced adventurer, by the way.)

Regrettably these flashes of originality (is it original?) are few and far between. The game also suffers from at least one bad technical fault. Like many other adventures, it has 'short' as well as 'long' descriptions of every location. You get the long one when you first enter, the short one thereafter – unless you say 'look'. The problem is that only the long descriptions give the exits from the location, so unless you keep a perfect map you keep having to say 'look'. This problem is compounded by the disc having to reload the overlay for each location every time you re-enter it – a most annoying wait when you have just forgotten how to get back to the limestone cavern. Disc-based adventures may be bigger, but they are definitely slower – sometimes irritatingly slow.

The game comes on twin 40-track discs, but can be transported across to 80-track discs. (It wasn't compatible with my drive, but I'm not sure whose fault that was. It worked fine on a friend's.) It will save your current position on disc, of course. There is also an Acornsoft hints and tips booklet in a sealed envelope.

Overall, this is an adventure for those of the adventuring fraternity who feel that the original *Colossal Adventure* has never been surpassed, and who like to while away their evenings on good old-fashioned adventure puzzles. There is nothing very startling here, but it should keep the traditionalists happy for a month or two. Personally, though, I think that at more than £17 it is a bit overpriced.

Peter Voke

PLUS FACTORS

Is Computer Concepts' upgrade to their *Wordwise* wordprocessor worthwhile? Patrick Quick reports

COMPUTER Concepts' *Wordwise*, is one of the easiest wordprocessors to use on the Beeb. Their new upgrade, *Wordwise Plus*, builds on the structure of the original to produce a very sophisticated and secure wordprocessor while retaining *Wordwise*'s ease of use. Anybody familiar with *Wordwise* can start using it immediately and will find most of the original features unchanged. The new manual is better written than the original and it's extremely easy to use.

The new features fall into two categories, 'fixes' to the original and additional facilities. There are several bugs in *Wordwise* – in certain situations it does not do quite what it ought. For example, as you SPOOL a file from *Wordwise* any embedded printer control codes are lost, leaving only a CTRL-B in the file.

If you use *Wordwise* only in the simplest ways then you may not notice the bugs, but I find that as a college lecturer producing notes, exams, documentation, etc, I use almost all the facilities available. There are also occasions when it's easy to make a simple mistake and cause yourself a lot of trouble. In *Wordwise Plus* the authors have managed to cure most of the old bugs and have added security to many operations.

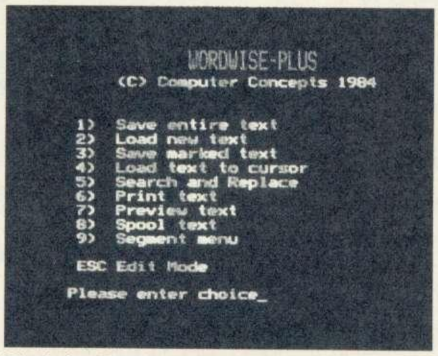
Many wordprocessors such as *View* or *WordStar* achieve extra sophistication by adding more commands and more special function keys. *Wordwise Plus* provides a built-in programming facility enabling you to write programs to perform complex tasks.

Improvements

Wordwise Plus does not appear to crash (as *Wordwise* often does) when the memory is exhausted. When *Wordwise Plus* starts (or restarts after you press Break) it automatically keeps your old text if it possibly can.

File saving and loading is faster than on *Wordwise*. The difference is hardly noticeable on tape, but on disc a long document takes only two or three seconds to load as opposed to, say, 10 or 15 seconds. On Econet the difference is astounding. Due to a lack of buffering by the network filing system (NFS), loading and saving *Wordwise* documents takes about one minute per page, which makes it almost unusable.

Wordwise Plus uses *LOAD and *SAVE rather than single byte input/output (BGET and BPUT), and the NFS handles these more efficiently. With *Wordwise Plus* files load over Econet almost as fast as straight from disc. Using *SAVE rather than OPENOUT also means that you only need the right space on disc, not &4000 bytes, and you won't get 'can't extend' on large files.



Wordwise Plus: loads files fast

I'm sure many readers have accidentally deleted a program or document by saving something else with the same name. If with Acorn's standard filing rules you create a new file with the same name as an old one the old file is automatically deleted; what's wrong with 'error – file already exists'?

On *Wordwise* this is made worse as the menu options for Save and Load (1 and 2) are next to each other on the keyboard. I've sometimes started up *Wordwise* and pressed 1 instead of 2. The input prompt 'Please enter filename' is the same for both, so it's easy to enter the name and save a blank document, deleting the most recent copy of your important file. I've been training myself to look at the menu to see whether Save or Load is flashing before pressing Return, but it's much safer to have *Wordwise Plus* do the checking for me.

Wordwise Plus checks with you if you are in danger of overwriting an existing file. The message 'Delete old file?' appears, and it tells you 'File NOT saved' if you press 'N'. I'd almost forgotten that it's possible for programs to be helpful.

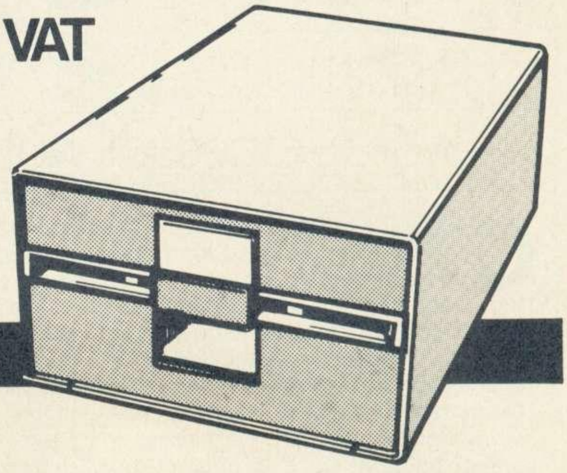
If you ask to load a file while you have a document in memory it checks 'Are you sure? (Y/N)' before overwriting the memory. It shouldn't be necessary to mention such features in a review because they should be present in all software.

When you save or load a file, *Wordwise Plus* tells you the 'previous filename', making it easy to work out the appropriate version number when you resave. You may also include the filename automatically in the printed document. You can then see at a glance which version you are reading.

A programming language has been added to *Wordwise Plus*. From the main menu a new option 9 gives access to a 'segment' menu. There are 10 segments available, each of which acts as a separate text storage area. Any segment can be used to store bits of text, programs, etc. The programs can act on the main text or on other segments. The program structure is very similar to BBC Basic but with features more suited to wordprocessing than to general data handling. There are commands for selecting the main text or a segment, moving the cursor around, reading and writing characters or lines, and calculations – I can only hint at the possibilities here. The programs are written in the segments using the normal wordprocessing features. To run a program in one of the segments you hold Shift down and press the appropriate function key. The seg-

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ments can also be called from embedded commands in the text. In this case, the action will take place while printing or previewing. Several useful examples are included in the *Wordwise Plus* package. One example program prints text in two columns. A second does 'mail merging'.

Wordwise's OC (output control code) facility enables you to send any code to your printer. With *Wordwise Plus* there are 10 programmable printer effects as well as the general OC command. By using these it's possible to change printers more easily. For the 10 effects programmed you need only to redefine the print sequences. These redefinitions could be programmed in one of the segments, perhaps with a menu of printer-types.

It's useful to be able to include separate files in a single printout. This means that when printing documents you're not restricted by your memory capacity. In *Wordwise* the command for this is GF for 'Get a File'. Any embedded commands in the file are ignored. Paging, justification, etc, are not performed on the inserted data. Also, printer control codes are lost from SPOOLed files and so can have no effect when you use GF.

Most of these problems have been rectified in *Wordwise Plus*. However a better solution is to use the new PF (Print File) command instead of GF. PF takes full account of all embedded commands and processes the file as an integral part of the document. It's easy to handle a large document in several files (possibly on several discs) but print it all together.

As in the original *Wordwise*, pressing Break while previewing or printing is likely to corrupt your text. The programmable 'preview page' and 'print page' facilities are extremely useful. You can preview or print a single page from a document.

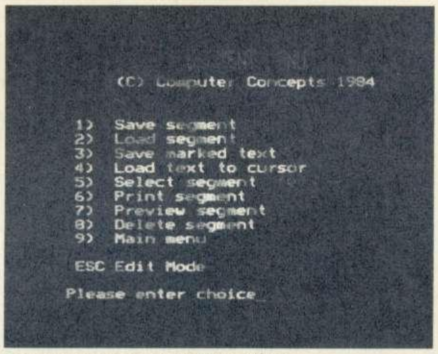
Unfortunately, there are problems with these facilities. To preview or print a particular page you need to reset the page counter and other settings yourself, even when the command is given from the menu – this contradicts the manual. Previewing a page is made useless by the fact that as soon as the page is finished it's cleared from the screen. The worst bug in these commands, however, is that they are totally useless when using PF. You always get the first page printed, whatever page you ask for.

Compatability

There are very few *Wordwise Plus* facilities that are not compatible with files produced using *Wordwise*. Most incompatibilities are clearly documented in a special section of the manual. They have all been introduced for sound logical reasons and the enhanced facilities of *Wordwise Plus* could not be offered without making these changes.

The only change that will prevent your *Wordwise* file printing on *Wordwise Plus* is in the PC (pad character) definition. For example, in *Wordwise* you use PC& to make '&' the pad character instead of the default '¦'. In *Wordwise Plus* you may use any string, including a string variable – so to specify a character literally you must put it in quotes, eg, PC"&". Using PC& with *Wordwise Plus* causes an error and the file will not print.

An undocumented change has occurred in the DT (define tab) command. The tab positions in *Wordwise* started with column 1 at the left-hand margin. In *Wordwise Plus* the left-hand column is numbered 0. The main problem this will cause when transferring documents is in combined IN (indent), TI (temporary indent) and DT layouts. IN



Segment menu: a new option

and TI are unchanged, which means that the change in DT will push tabbed positions one step further right and hence out of line.

Conclusion

I feel that the upgrade cost of £17 is worthwhile if you use your *Wordwise* much. If you are thinking of buying *Wordwise* now you can find the price discounted by some suppliers, but you should consider making the extra investment in *Wordwise Plus*. The new facilities make it a powerful and flexible piece of software.

Having praised the new product (I will certainly use it myself), I must say that the few remaining bugs are irritating. Many of the pitfalls we have learned to avoid in *Wordwise* have been eradicated but new, more obscure ones are lurking in the new, more sophisticated features of *Wordwise Plus*.

Wordwise Plus costs £49 + VAT. The upgrade for Wordwise users is available through Computer Concepts only at £17 + VAT

Some examples of Wordwise Plus at work

Multi-file print

This uses segment 0 to print a multi-file document, including prompting for disc changes.

```
SEG 0
REM SEG 9 contains a list of files
REM        and drive selections
SELECT SEGMENT 9
DEFAULTS
P%=0
CURSOR TOP
REPEAT
A$=GCT$
IF A$ =":" THEN GOTO DRIVE
IF A$ ="^" THEN GOTO DISC
.FILE
B$=A$+GLT$
PREVIEW FILE B$
GOTO FINLINE
.DRIVE
OSCLI "DRIVE "+GLT$
GOTO FINLINE
.DISC
B$=GCT$
C$=GLT$
CLS
PRINT "Insert ";
PRINT C$;
PRINT " disc into drive ";
PRINT B$
PRINT "and then press RETURN ";
REPEAT
UNTIL GET=13
OSCLI "DRIVE "+B$
.FINLINE
UNTIL EOT
END
ENDSEG
```

Sentence length program

This routine can be stored in any segment – if it's in segment 0, for example, hold Shift and press f0 and it will give the average sentence length of the current text or segment.

Your current position is marked with a pair of unlikely characters ('~' and '{'). The count, A%, is zeroed. The routine then repeatedly FINDs full stops and counts them. At the end a RECOUNT is requested to ensure the correct value of W% (word count). The average length is calculated using A%-1 as the last FIND will usually fail.

```
REM count sentences
TYPE "~{"
CURSOR TOP
A%=0
CLS
REPEAT
FIND "."
A%=A%+1
PRINT A%
REPEAT
UNTIL GCT$<>"."
UNTIL EOT
PRINT
RECOUNT
PRINT "Average sentence length is ";
PRINT W%/(A%-1)
PRINT "Press any key";
PRINT GCK$
CURSOR TOP
FIND "~{"
DELETE AT 2
DISPLAY
```

A spritely ROM for Forth graphics

'G-Forth', K M Williams, 314 Chester Road, Streetly, Sutton Coldfield, West Midlands B74 3ED, £33

'You're familiar with Forth' IF 'this may make sense to you' ELSE 'it probably appears to be gibberish' THEN.

In case you didn't guess, the purpose of that sentence was to illustrate that the computer language Forth, with its post-fixed operators and extensive stack manipulation, requires its programmers to be prepared to bend their minds to a syntax somewhat removed from normal English usage. The rewards for doing so are fast, compact programs, ideally suited to real-time applications such as control and arcade games. Forth is a compiled language and, by its nature, it encourages well-structured programs.

G-Forth is a new 16k ROM-based version of the language which has been designed specifically with fast graphics in mind. While Acornsoft Forth will allow access to the VDU drivers, this version goes further and incorporates sprite facilities.

Because of its fast execution speed, Forth is often considered an ideal language for the development of arcade-style graphics. There are a number of Forth-based 'games-generators' available for another popular home computer; some arcade machines themselves are rumoured to be programmed in Forth. For time-critical program segments where even Forth is not fast enough, it is still possible to revert to machine code routines, as this version includes a built-in Assembler.

The sprite graphics would almost certainly be a major consideration in choosing this version of the language in preference to others. The number of sprites that can exist simultaneously is subject only to memory limitations, and this will depend on the graphics mode used and the size of the program. A number of Forth words are included specifically for sprite manipulation. For example:

```
640 512 FRED SPR-IN
```

will place a sprite called FRED at the centre of the screen. If FRED is already on the screen, it will first be erased from its current position. Sprites are drawn using EOR (exclusive or) plotting and so have their images distorted when passing over other objects. The sprites can be interrupt-driven which allows a form of multi-tasking (or at least dual-tasking). Once the command has been given to move a sprite to a certain destination in a certain number of steps, it will continue to move about the screen at the speed chosen. A separate 'foreground' program may be run concurrently, interrupted briefly at regular intervals while the processor devotes itself to moving the sprite one step.

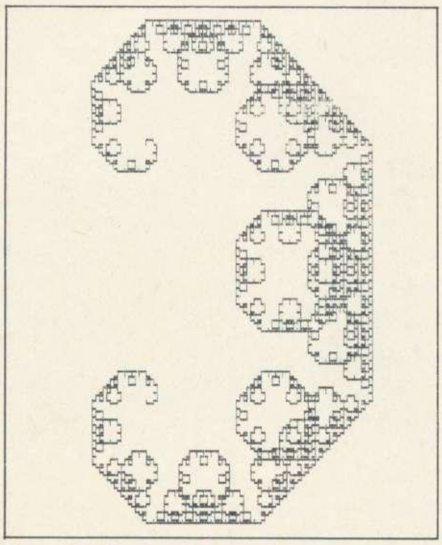
For example, the command:

```
8 4 200 128 FRED SLIDE
```

will cause FRED to move 200 steps of eight horizontally and four vertically at a rate of 25 steps per second.

The use of interrupts also makes it fairly easy to have a number of sprites moving around the screen independently.

The sprite may also be programmed to move an indefinite number of steps until a collision is detected. The collision may then initiate its own interrupt to service an appropriate routine. Some of the sprite commands are fairly complex, although the documentation and the demonstration programs provide enough practical examples to get started.



Example of recursive programming in *G-Forth*

G-Forth claims to incorporate the entire Forth-79 core vocabulary and standard extensions, plus most of Fig Forth. In addition it includes a large number of extra arithmetic commands; 16 and 32 bit integer and 32 bit floating point arithmetic are all catered for in the vocabulary. Floating point numbers are stored as a 24 bit mantissa and an eight bit exponent, giving an accuracy of about six decimal places. Other additions include sines, cosines, tangents, natural logarithms and exponents. The trig functions will normally yield floating point values but as an aid to speed and compactness there are two particularly useful words: SIN* and COS*. For example:

```
100 35 SIN*
```

will give the value of 100 * SIN(35) as a 16 bit signed integer.

The PLOT command operates in a similar way to its Basic counterpart. MOVE and DRAW could be defined:

```
: MOVE 4 ROT ROT PLOT ;
```

and

```
: DRAW 5 ROT ROT PLOT ;
```

Use of the, as yet, unimplemented plotting codes 96 to 107 gives a very fast complex-area fill. A bonus is that these routines can also be accessed from Basic if they are first enabled by *FX 163,0 (an OSBYTE call unused by OS1.2).

As a result of the security built in to many Forth compilers, to prevent the execution of erroneous definitions, it is not generally possible to compile a word which contains a reference to itself. *G-Forth* does not apparently contain this safeguard so although recursive definitions are easily implemented, care will be needed to guard against faulty or incomplete definitions. If you press Escape while entering a definition in order to abandon it, it still remains active in the dictionary.

The language claims to be faster than other 8 bit and some 16 bit implementations of Forth. This was borne out by some timing comparisons with Acornsoft Forth. In most cases it was 10 per cent to 30 per cent faster but an astonishing 400 per cent quicker where division of 16 bit signed integers was concerned.

The astonishment diminished a bit when I discovered that this is at least partly due to the fact that, unlike Acornsoft, *G-Forth* does not check for division by zero: 12 divided by zero places a value of 15 on the stack! To be fair, most other common errors seem to be trapped adequately and *G-Forth* is not entirely alone among Forths in not detecting this one.

G-Forth also showed a considerable advantage when executing code which had been compiled from a series of nested definitions. This means that it is possible to write large well-structured programs based upon a series of smaller, more managable definitions, without sacrificing too much speed. Probably the main reason for the speed of this version is that, unlike most other Forths, it compiles directly into true executable machine-code rather than into the more usual intermediate code.

The documentation consists chiefly of a quick reference guide to all the available commands and their effects on the stack, and a more detailed description of those which are unique

to *G-Forth*, particularly those involved in sprite manipulation. There is also a brief introduction to Forth for newcomers to the language but, as is pointed out, beginners will need to refer to a standard textbook on the language – several of which are recommended – in order to progress. It will be necessary for anyone studying the language in depth from such a book to take account of the slightly different structure of *G-Forth*'s dictionary.

The ROM includes a full screen editor which I found much more convenient to use than the more common line editors. For the benefit of those who may prefer a line editor, one is supplied on the utility tape which comes with the package. The tape also includes a sprite design program, a tape to disc transfer program for Forth screens and demonstrations of sprite graphics.

Although either cassette or disc is suitable for mass storage of Forth screens, a disc drive naturally makes life much easier. Since the standard DFS allows only 31 files per disc, it is wasteful to save each Forth screen as a separate file. Even a 100k disc will have more than half its capacity wasted if used in this way. The ROM provides several different storage methods which overcome this problem – one of these organises the whole disc into one big random access file. A 100k disc will therefore hold about 100 screens instead of being limited to just 31.

G-Forth gives good value for money compared with other ROM-based versions of the language, particularly bearing in mind that it's a 16k ROM. Its major selling point is probably the sprite graphics, but £33 is still quite a lot to pay just for the privilege of generating games that will only run on your own machine or that of someone else willing to fork out the money. To get the most from the sprites, you need to be fairly fluent in Forth, so, if you're tempted, it might be a good idea to first become well acquainted with the language via a cheaper, spriteless implementation such as Acornsoft's.

The floating point routines and trig functions are a useful addition to Forth but the majority of applications which require them are not particularly time-critical. I'm probably not alone in finding it more convenient to program them in a higher level, if slower, language such as good old Basic.

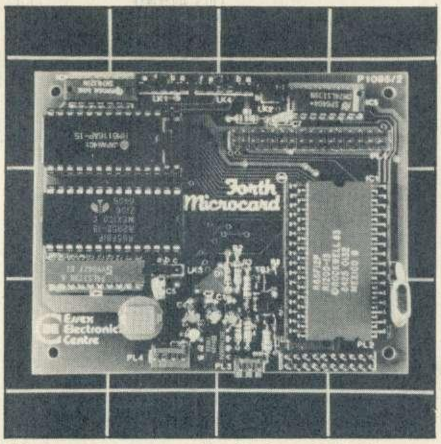
'You're attracted to Forth as a programming language and want to write fast arcade-style graphics programs without resorting to assembler' IF 'this version may be the one for you' ELSE 'you'd best stick to your own favourite programming language' THEN.

Malcolm Banthorpe

Forthright firmware

Essex Forth Microcard, including Rockwell R65F12 and development ROM and Essex Forthwriter software on disc, Essex Electronics Centre, Essex University, Colchester, Essex CO4 3SQ, £119 (plus £48 for Forthwriter disc).
Multi-Forth 83 ROM (optional De Luxe software on disc), Skywave Software (tel: 0202 302385), £45 plus VAT (De Luxe system £80 plus VAT).

BOTH these products implement Forth on the BBC micro, but they are very different: whereas *Multi-Forth* 83 is a conventional language ROM, the Microcard is an independent Forth computer that can use the facilities of the Beeb.



Microcard: a computer that controls the Beeb

The Microcard is designed to be built into other machines, which it then controls. Its heart is a Rockwell R65F12, a single chip (based internally round a 6502 CPU) that can run compiled Forth programs stored in external memory. The external program can use kernel works – RSC Forth – resident in the R65F12 and would be put in ROM in one of the two memory sockets on the Microcard board.

Although the R65F12 can run Forth programs on its own, it can't compile them because the dictionary names have been stripped off it. So to develop the external program you need a development ROM with the names and some utilities, and some RAM. The Essex *Forthwriter* disc provides software to make the connection to a BBC micro, with its keyboard, display and disc system.

The Microcard seems carefully designed, with the right features for all this (for example, a target compiler, interrupt handling and programmable behaviour on power-up). But as a Forth implementation for the BBC its Fig-Forth is nothing special.

Multi-Forth 83, supplied as a 16k ROM, is more relevant for Beeb owners. Its conventional part is Forth-83, with some extra facilities related to the BBC's operating system. The outstanding feature is its multi-tasking. Several Forth words can be set running as independent tasks under a time-sharing supervisor, each with its own stack and user variables (such as BASE). They all share the same Forth dictionary.

Five uses for multi-tasking occurred to me: serving several users (which didn't seem appropriate); independent tasks displaying through screen windows; interacting tasks such as objects in a game (eg, dwarves); background tasks while you edit something (printing seemed possible, but not compiling because of its heavy disc use); and new parallel processing algorithms (but I'm not very familiar with these).

To illustrate independent windowed tasks, the *Multi-Forth 83* demonstration disc sets up a beautiful display with five tasks going at once. One draws a high-resolution graph, which in the real world could be monitoring an instrument hooked onto the computer; one shows the time; two have continuous printouts; and the remaining one is the Forth system as you normally expect it.

I thought RUN could be better used from within other colon definitions (surprisingly, it does work like this) if it returned as a result the task number of the new task it sets up (like fork in C/Unix). More seriously, the primitive Fig-Forth line editor can't use the BBC's Copy key under multi-tasking. The Essex *Forthwriter* can interface with decent screen editors, and it's a pity other Forths can't too.

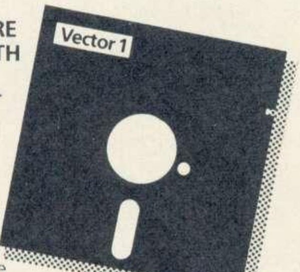
The manual ought to be more precise about the features unique to *Multi-Forth 83* (for instance, the stack effects of the multi-tasking words aren't specified and the filing system didn't seem to work as they said), although I usually managed to find out what I needed to know from it.

As an ordinary Forth, *Multi-Forth* is perfectly adequate and has the edge over Acornsoft Forth. As a multi-tasking Forth it is generally well worked out, although you won't get far without windowing. So if you seriously use multi-tasking you will almost certainly need the De Luxe utilities disc as well. I'm sure anyone who writes games or control programs will find it a delight even though the editor needs improving.

The Forth Microcard is aimed at a rather different market and is not recommended as a simple Forth system for the BBC. **Steve Vickers**

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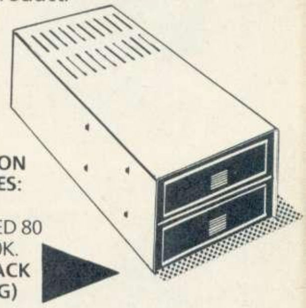
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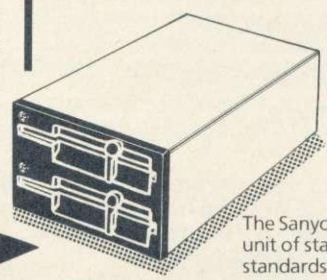
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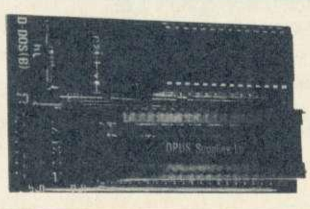
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DFS ROM (100% Acorn compatible) complete with manual. Also single ribbon and power cable for disc drive. ROM and manual only £8, cables £4.50. M Brooke, Shackleton Primary School, BFPO 38.

INTERESTED in exchanging ideas, tips, etc on the BBC model B. Contact Joseph Borg, Cardona 58/2, St Lucia Street, Valletta, Malta.

ATOM/ELK Pen pal or tape pal wanted. Interested in hard/software, also swapping programs. Contact: Gabriel Lopez, 4 Rue Richemond, Debassyns, 92150 Suresnes, France.

PENFRIEND wanted to swap ideas and programs. Write to Philip Stamp, Old School House, Welbury, Northallerton, N Yorks DL6 2SE.

GREECE. BBC user wants correspondent in Greece for the exchange of ideas, programs, etc. Write to Stalios Kontozoglou, 11 Agias Paraskevis, Kiffisia, Athens, Greece. Tel: 8086258.

WANTED for BBC. Has anyone the software to enable me to do astrology? In particular, calculation of natal chart and aspects. Details please to B Cattermole, 7a Cheyne Walk, Wellington, New Zealand.

GERMAN BBC user. Ideas on hardware and software wanted. I've used discs, printer, modem. Number of friends are users in Europe. List to Lars Steinsträßer, Grüner Bogen 44, 2000 Oststeinbek FRG. (040/7125297).

FRENCH BBC user searching for contacts. I've used discs. Have a lot of French and Belgium BBC Users. Miss Fabienne Ferrer, 136 Rue Championnet, 75018 Paris.

ACORN disc upgrade kit. New, £80 including instructions. Also slimline one-piece phone (brown), touchpad, dial & LED, £12. (New plug.) 0227 751100 (Kent).

KENDA professional DMFS, double density, CP/M conventions, erased files recovered, no memory used by DMFS – PAGE at &E00. Complete, £80. D Wadge, Sgts Mess, RAF Gutersloh, BFPO 47.

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SELLING month old BBC B, 1.2OS, issue 7, Basic II, Acorn DFS, Box of 3M discs (11), 400k d/s d/d, 40T/80T switchable single drive. Mint condition, boxed, manuals + leads. All items under guarantee, £480. Tel: 01-965 4212 (Nilesh) after 6 pm **only**.

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BBC B + Acorn DFS, fitted with Torch Z80 second processor + 800k disc pack. Worth £1490 + software including Perfect/Writer/Speller/Calc/Filer. £950. Will split. Amersham (02403) 21702.

ENCLOSURE for Teac 55 single disc drive, complete with data ribbon cable and power cable. £10 the lot. 11 Cairnshill Close, Belfast (0232) 703417.

ELECTRON, Plus 1, View, First Byte interface, Quickshot II, over £130 of original software. Worth over £400: only £280 or swap for Beeb + Acorn or Watford DFS. Phone Jon, Wednesday evenings. 01-370 0563.

ACORN System 1. 6502 machine code µcomputer, 8 digit hex display, hex keyboard, cassette interface. Requires circuit information on monitor and parts to expand system for VDU, qwerty keyboard, disc drive, printer. 46 Valley Gardens, Downend, Bristol. Tel: 563151.

CHEETAH speech synthesiser, boxed with instructions and software. Unwanted gift. £20 ono. BBC joysticks, pair, £7. Tel: (0745) 51032.

DISC drive 200k 40 track d/s cased. All leads, manual, utilities disc. As new, £75. Acorn Atom FP, Wordpack, Toolkit, Font. Loads of software, books, £55. Swap either for BBC goodies. Wrexham 842156.

SWEET Talker £17, Quickshot joystick modified for BBC £13. Assembly language for BBC – book, £3. All 2 months old. Phone: Leamington 613379.

FOR SALE Acorn Electron, 12 months old, £75 worth of games. First Byte joystick interface. Tel: Cockermouth (0900) 825213 after 4.30 pm or weekends. £160 ono.

JOYSTICK. Quickshot, driver program, £9. Phone David, evenings, 0756 3482.

BBC B 1.2OS + DFS with View wordprocessing chip, double 200k 80 track disc drives, monochrome monitor, Juki 6100 daisywheel printer. Four months old. £995. Could separate. Tel: Cambridge (0223) 811436 (evenings).

WANTED: Damaged BBC B any condition. Ring: Farnworth 709738 after 7 pm weekday; anytime weekends or write to P Gowder, 2 Carlisle Close, Little Lever, Bolton, Lancs BL3 1TF.

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MAGAZINES for sale. Most PCN, some PCW's, some CVG. Tel Chris on 01-550 0806 or send a postal order to 12 Lord Avenue, Clayhall, Ilford, Essex.

WANTED: Brother HR15 daisywheel printer and/or single sheet feeder for HR15. Must be in good working order, top price paid. Phone David on 0324 558692.

WANTED: Video Genie EG3003 expansion unit with RS232 interface. A N Sloss, 39 Warkworth Street, Cambridge CB1 1EG. Tel: 0223 352501.

DISC drive, 100k Teac 5¼in. full height with PSU, cables and software, £80. Also Aries B20 graphics RAM board, unused, £50. Tel: 01-942 9661 x227 (office hours only).

TORCH Z80 and disc pack. (including software). For details phone 0272 565149.

LVL twin single sided 40 track disc drives, £170 ono. Bognor Regis 551117 or 552176.

DISC drive for sale. Olivetti (as in Acorn drives) 200k. Looking for about £80. Offers welcome. Ring Zia after 5pm on weekends 01-226 1498.

QUEN Data daisywheel printer, 8 weeks old, still in box, 10 month guarantee, BBC compatible, auto underlining, bold type, many other features, £200. Tel: Birkenhead (051) 652 4551.

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BBC B + DFS, 100k disc drive, Music 500 synth, speech system, B/W TV, joysticks, £700 of software. Cost new £1,300, will sell for £750 or will split. Phone Danbury (024541) 3121.

DISC interface: Microware's DDFS v.1.10, 128 files per side, double density. Unwanted gift, boxed, £85 ono. Tel: Tim, Cardiff (0222) 621689.

DISC drives. Two 200k, double sided, 40 track Shugart drives. Suitable for BBC. Complete with leads, manual, utilities disc, etc. A bargain at £95 each, £180 for both. Phone: 0625 861382 (Cheshire).

BBC B, OS1.2, 14 inch Decca colour monitor, Pace Nightingale modem with Commstar ROM. Games plus cassette recorder, brand new computer desk. All very good condition. £600. Will consider offers. Tel: 0270 820700, evenings.

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ATOM originals, 9 tapes including 747, Chess, Invaders (Bug-Byte), Lunar-Lander, (Program-Power), and Acornsoft Star-Trek, etc. £4 each or £20 the lot (inc p&p). Phone Gareth on 0222 798582 after 7 pm.

KEMPSTON joystick and interface for Spectrum, £16. Anyone interested in swopping games, ideas, for Beeb? Paul Stevenson, 19 Marland Hill Road, Sudden, Rochdale, Lancs OL11 4PQ.

ACORN Bitstik plus 6502 2nd processor. Two months old, special price £500. Also Minor Miracles auto-dial/answer board £44. Cumana 100k drive £50. Or everything for £550. Call 01-450 0832.

SWAP FM scanning monitor receiver 30-50 MHz, 144-174 MHz, 450-512 MHz. Cost over £100. For BBC disc interface or Spectrum or sell for £50 ono. 2m crystals included. S Tron, 331 Loraine Walk, Newton Aycliffe, Co Durham DL5 4NU.

TELETEXT adaptor for sale. One month old and perfect condition. Complete with ROM and manual £150 ono. Tel: Parracombe (05983) 353, evenings.

COMPLETE system. Model B + DFS + 800k double disc drive 40/80 switchable + printer (Epson FX80) + Pascal and other EPROMs. All perfect condition with manuals. Total £1000. Also many discs, books. Tel: R J O'Connor 0803 615633.

EPROMS! 2764s (Hitachi) only £5 each. 27128s only £14 each. Only a few, so first come, first served! Postage extra. Phone 061-485 2848 evenings please and ask for Stuart.

ADVENTURE helpline. For help on Snowball, Riddles, Hobbit, etc (not an expert but will try to help). Swap for any other help. Ring Andrew (evenings) 06845 65522.

PRESTEL adaptor. No longer required, little used. Offers in region of £100. Tel: (03543) 5595 (Peterborough area).

ELECTRON with tape recorder, joystick interface and £100 of software. Worth over £300, sell for £180. Tel: Yardley Hastings 745 any time after 4 pm.

FOR SALE Magazines from Your Computer to PCW, Sinclair User, Acorn User. Worth approx £20. Also book – '20 Simple Electronic Projects for Spectrum and ZX81', worth £7. Sell for £15. Tel: I.O.M. 822945.

OPUS double density disc interface for BBC. Latest version (3.35). Runs Acornsoft Elite. Brand new, £80. Phone: 0795 522100 after 6 pm.

SPEECH synthesiser and speech recognition units for sale with software. Unlimited vocab. Plug straight into BBC micro. £50 for both or will split. Contact Max on Bristol (0272) 48401.

SPECTRUM, 16k only £35. Write to S K Ward, 16 St Mary's Road, Long Ditton, Surrey KT6 5EY or phone 01-398 2523.

WANTED. BBC micro model B. Will pay £225-£250 for Beeb in good condition, OS1.2 only. Would consider DFS or upgraded model A if right price. Phone 061-485 2848 and ask for Stuart.

ACORN Electron as new, leads, magazines, user guide, Acorn Electron guide, program guide, advanced user guide, boxed, guaranteed. £150 ono. Tel: (0404) 41023 (Mark).

MODEMS: Acorn Prestel adaptor £125. Buzzbox 300/300 baud £50. Both boxed as new, unwanted presents. Telephone: Great Milton (Oxford) 8197.

FIRST BYTE joystick interface and joystick for Electron. Excellent condition, £20 or swap for other items for Electron Plus 1. W Reid, 9 Primrose Bank, Springfields, Wigton, Cumbria.

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OFFICIAL BBC joysticks. Brand new, still boxed – £12. Discovering BBC Micro Machine Code – £5. Advanced Machine Code Techniques for the BBC Micro – £5. Write to David, 'Palmiste', Owlsmoor Road, Owlsmoor, Camberley, Surrey.

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BBC B and Acorn DFS fitted with Torch Z80 second processor and 800k disc pack. Worth £1,490 and software including Perfect Suite (reputed to be worth £1,000). £950 but will split. 02403 21702.

WANTED disc drive for BBC B. Switchable if possible, with power supply. Good condition only. Phone evenings and weekends, Portsmouth 730612.

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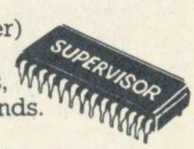
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(sorting programme: Gemini marketing)

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■ **Printer** Tandy DMP100, similar to Seikosha. Full dot addressable graphics, double width and underline. Fast. Tractor feed. £85. 9 Cavendish Road, London SW19. 01-542 0469.

■ **BBC B** bargains! Whist, Draughts £4.95 each or £7.95 pair. J S Bach Brandenburg concertos 3, 6, Toccata & Fugue £3.95 each, £8.95 complete. Discs add £1. DotSoft, PO Box 46, Hitchin SG4 0XQ.

■ **8 inch** disc DFS, Acorn DFS compatible. ROM + instructions £35 inc. p&p. Sae for details. Vogan Products, 21 Grove Road, Hazlemere, Bucks HP15 7QY.

■ **'Right on** Commander!' How to become Elite more quickly. Many pages of advice (including cheating). Only £1.95. Helm, 45 Woodhall Grove, Bishops Stortford, Herts.

■ **BBC B** Ways to make your Basic programs unlistable and unstoppable. Explained in cassette program. Send £1.99 to R Jenkins, 94 Bishopston Road, Bishopston, Swansea SA3 3EW.

■ **Four BBC** games on separate cassettes for £8! SAS Commander, Staircase Stampede, Custard Pie Fight, Serpents Lair. Comsoft, 67 Kent Road, Harrogate, N Yorks. Visa. 0423-57464.

■ **Electron** £100, Plus-3 interface £200, monitor £60, over £300 software for £150 or £450 the lot. Phone: Friskney 615 or write to: T Welch, Church End, Friskney, Boston, Lincs.

■ **Torch** Z80 Card ZEP100 with Perfect software £150. Miracle WS2000 modem £75. Apple II disc drive £40. 8271 disc controller £30. Ian (0763) 41720.

■ **EPROMs** – Hitachi 27128G-25 £7.49 each. Any quantity. Add 50p per order p&p. P&R Hardware (Dept AU1), 134 Manchester Road, Swinton, Manchester M27 1EP.

■ **Vadpast** (BBC B). Powerful art and design software. Menu driven. Send sae for details. £7.95 cassette. Cheque/PO to A Cook, 6 Dashwood Close, West Byfleet, Surrey.

■ **Atom disc labeller.** Prints title and catalogue to an Epson-compatible printer. Full instructions included. £10.95. Atomic Computer Systems, 1 Cowley Crescent, Padiham, Burnley, Lancs BB12 8SX.

■ **Torch** Graduate model G800/2 with dual drives and 256k memory. Complete with Psion Xchange software. Cost £1012, will accept £750 ono. Telephone 01-864 4567, weekends only.

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■ **TWIN** will provide backups of your valuable protected discs. This powerful utility is subject to continuous development; success guaranteed or your money back. Return of post service. £8. J E Connett, Dene Croft, Westcott Street, Westcott, Dorking, Surrey RH4 3NY.

■ **Acorn** Z80 2nd processor, practically unused, £295. Mannsman-Tally M80 printer, £110. Wanted: EPROM programmer, eraser, sideways RAM/ROM board, EPROMs. Write: John, 199 Court Road, Orpington, Kent BR6 0PX. Tel: (after August 22nd) Orp. 37955.

■ **Hackers!** List the Unlisted, a guide for the novice. Trace unlisted computer phone numbers, auto-dialler routines, log-on, networks, telephone medium, legal notes, £6.50. Andersons, 56 Waterloo Road, Freemantle, Southampton.

■ **EPROM** backup service: protect your valuable EPROMs. A must for external ROM socket users! Send Master ROM + blank EPROM(s) + £1.99 each. EPROM erasing 50p extra. Blank EPROMs available at £8/2764, £12/27128. Can also ROM your program from cassette/disc – prices as above. All prices fully inclusive. Giles Read, The Old Station, Powerstock, Dorset DT6 3ST.

■ **Super Teams!** Bio-rhythms and compatibilities for lovers, athletes and team selectors. 40T £10, 80T £11. Gilvale Software, 10 Sidford Close, Hemel Hempstead, Herts HP1 2LF.

■ **Wordwise extras.** Want to preview in black-on-white, paged mode, with line numbers, margins, and page breaks displayed? Print £/# signs correctly (even Watford NLQ)? Sort lists? £3.45 each or details with sae. Know-Ware, 79 Nottingham Road, London E10 6EP.

■ **'D-Master':** The most powerful disc backup program seen so far: £7. Nutcracker owners: £3. Handles sectors from 128-2048 bytes, deleted or not, etc. R-Soft, 22 Marriotts Close, Felmersham, Beds MK43 7HD. 0234-781730.

■ **Fast Basic/machine** code disc index. Catalogues Watford 31 or 62 or Acorn standard discs easily. Features very fast search (20,000 filenames per minute). Holds 200 disc catalogues on 80-t, 100 on 40-t. State 80/40, single/double side, single/double drives. Also allows examination, printing of any/all catalogues. £8. J MacRae, Officers Mess, RAF Bruggen, BFPO25.

■ **'Nutcrackers':** tape-2-tape + tape-2-disc + disc-2-tape + disc-2-disc + tapemaster: £5. Rompull: £5. ROM-filing system generator: £5. R-Soft, 22 Marriotts Close, Felmersham, Beds MK43 7HD. 0234-781730.

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■ **Science Software** for the BBC microcomputer. 16+ to 19+ Physical Science & Chemistry software. Simulations, CAL, Assessment and Games. Discs and cassettes. Send stamped sae for FREE catalogue to: G A Herdman Educational Software, Department NS, 43 Saint Johns Drive, Clarborough, Retford DN22 9NN.

■ **50 high** quality BBC B games on one tape. Includes Galactic Jailer (100% machine code original arcade game), Haunted Mansion (400-room 3D graphics adventure), Zaks, Night Rider, The Doctor, Mini-Opoly and much more. All for only £7.95. Ranjan, 3 Wensley Close, Harpenden, Herts AL5 1RZ (immediate despatch).

■ **'How-To'** move your s/w from tape to disc. An essential collection of s/w and information for frustrated disc owners: £5. R-Soft, 22 Marriotts Close, Felmersham, Beds MK43 7HD. 0234-781730.

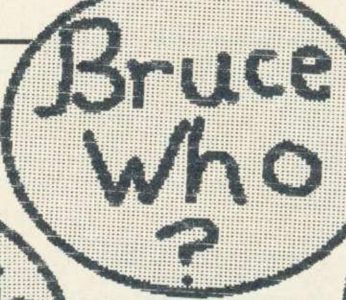
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■ **The use of** the Acorn BBC B and Torch systems in house care and medical research. Wednesday July 3, 1985. Workshop for experienced users. Introduction sessions for new users and would-be users. Organised at the Unit of Medical Information & Technology, Queen's Medical Centre, Nottingham. For further information, apply to the Conference Organisers: MedStat Ltd, City House, Maid Marian Way, Nottingham NG1 6BH. Tel: Nottingham (0602) 411120.

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ACORN ABUSER'S Diary

Floored at Acornsoft

ACORNSOFT was moving out of its prestigious Betjeman House premises to Acorn's spacious Newmarket Road site (which formerly housed the now-redundant customer support crew) when the removals company noticed it was still owed money from the last move.

Their simple solution: Pay up or you don't get your furniture or equipment back. A chairless Acornsoft spokesman was too floored to comment.

Royal outing?

IF YOU hopped along to the Royal Show in Kenilworth at the start of July, you might, or might not have seen Acorn there with its software for farmers. We went to press before the event, but its appearance depended on whether the software was marketed by Acorn, Acornsoft, or someone else.

What's in a name?

AFTER the recent announcement of more sackings to reduce staff levels at Acorn, there might be seen to be acid comment in the nickname given to Alex Uboldi, the new acting managing director. Uboldi, who comes from Olivetti, is known, cuttingly, as UB40.

Micro magic

DAVID Hambly is a magician who uses a computer as part of his act (you may have seen his piece in last month's Atom Forum). He used to have an Atom which he bought for £10, and was due to come in to the Acorn User office to sell it to Commander Bruce Smith (for £30 – now that is magic!), but he never turned up. The reason: he had to stand in at a club in Scarborough for a ventriloquist who had lost his voices!

The Hambly magic is now performed on an Electron, and the £30, when finally handed over, went towards a Plus 1.

On the game

LATEST software under development at Acorn includes: *Olivetti Invaders; Workstation Emulator* on the Atom; *Atom Emulator* on the Workstation; *Viewless* for the BBC micro that has everything; *Wordwise Plus Plus* with the help of Debugsoft; *Creative Accounts* with Peter Winn; *Cooking with Curry; Italian as She is Spoke* by Garry Baldi; *German with Hermann.*

News in brief

COMMISERATIONS to *Elite* authors Bell and Braben in losing out to *The Hitch Hiker's Guide to the Galaxy* in the software awards. We did invite Douglas Adams in for an exclusive interview, but he got lost.

ACE reporter Orson Fact's interview with *Sunday Times* reporter Jane Bird has had to be postponed. Orson is still cleaning the Snopake off his screen after the last session on his wordprocessor.

AMX Mouse up for grabs

YOURS to cut out and keep are these four badges by Nick Evans so you can boast your allegiance to the Diary at the Acorn User Exhibition.

But better still, why not produce your own? AMS is offering one of its amazing AMX Mouses for the best badge handed in to the *Acorn User* stand at the Exhibition. If you've already got a Mouse, AMS will provide a set of their Desk and Utilities discs.

We might even save a spot in the hallowed Diary for the best offerings.

Warning bell

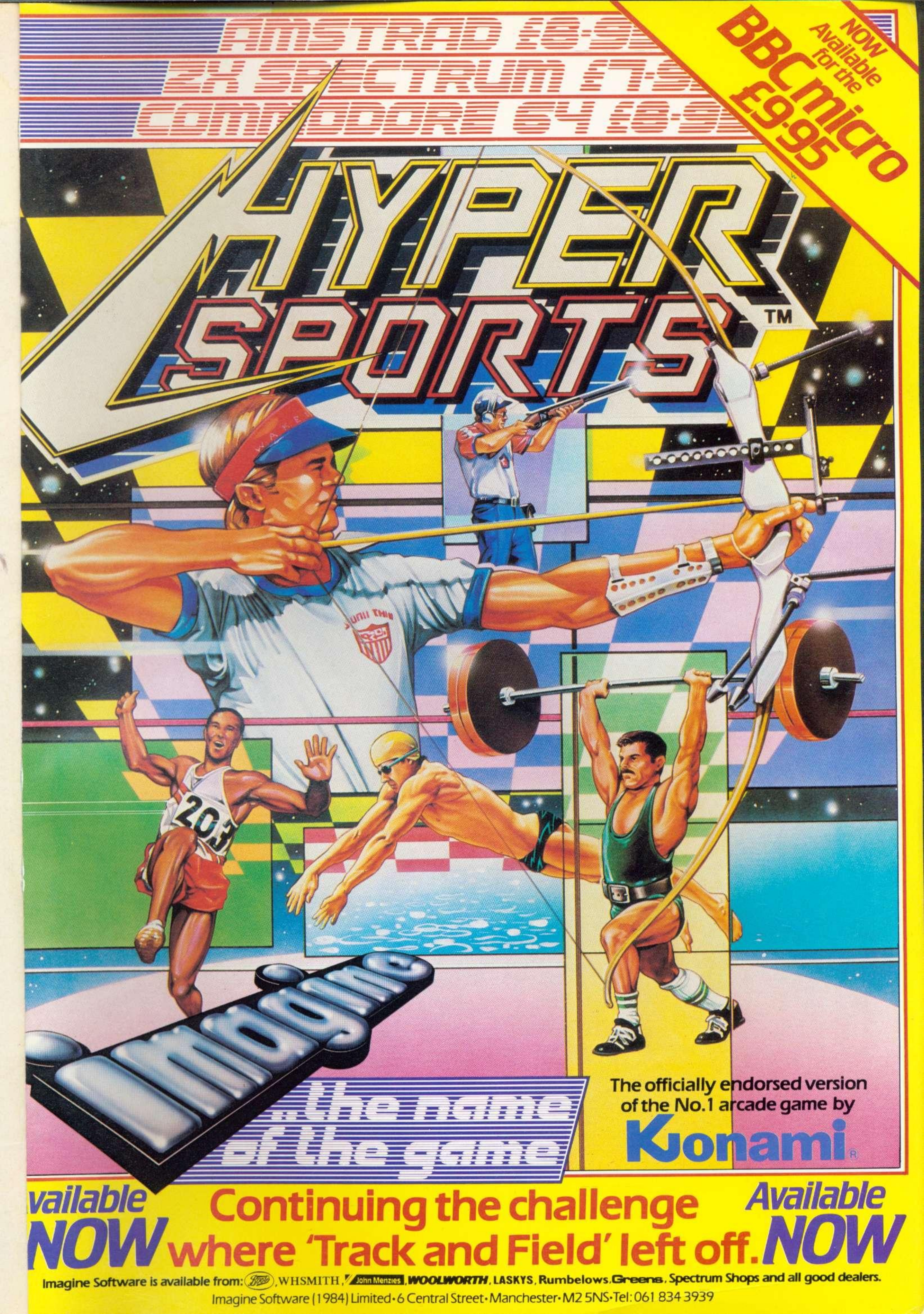
A TASTE of things to come came through on the Acorn telex machine a couple of weeks before it was announced that Quentin Bell were no longer to handle Acorn's public relations. It read simply: So long, nice knowing you folks.

Xword results from Dally Expresso

HEREWITH the answers to last month's crossword handed in to us by the ex-staff of the Dally Expresso (PS a first class stamp costs 17p). Runners up prizes went to: Barry Wood (there are two e's in 'tree'); David Bamboozled (well-known Micronet Mills and Boon author) for his spelling of Moir; N Jessa of Watford (who never has a cross word); Mrs P Hauser (the only one who spelt Her Man correctly); a syndicate from Computer Concepts who just got 2 Down wrong; Orlando Pilchard (who's Nsoft?); R McMilan, who spelt 'sheet' incorrectly; Sinclair Research who've nearly finished; Gwyn Matthews for his answers in Welsh; Mike Barwise and Harry Sinclair who bearly finished.

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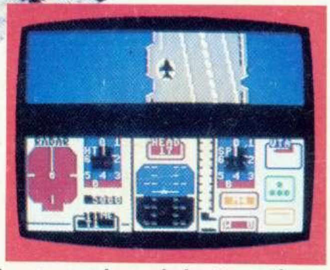
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Written by
Vaughan Dow
Jump Jet Pilot





Every pilot has the dream of flying one of these unique and complex fighting machines. Here is your chance to do what few pilots have the privilege to try.
Depending on your skill, confidence and courage, you have the choice of remaining near the landing pad, learning to hover and land, or venturing higher to practise your approaches.
When you think you have mastered these, then accelerate the Jump Jet into an attack fighter. Use the radar and range finder to seek and destroy the enemy, by launching heat-seeking air-to-air missiles. Beware! His radar and missile systems are as good as yours. Reckless pursuit is ill-advised: you must maintain a fuel level that will enable you to relocate and return to the aircraft carrier, executing the skills you have learned to achieve a successful landing.
You are now ready to proceed to the next skill level to face additional hazards, such as unpredictable swell and treacherous cross-winds.
Be warned, this program is not a toy or game. You will need to co-ordinate your hands, eyes and mind to successfully complete each mission. Do not hope to achieve in a short time that which took the author three years to learn as a Jump Jet pilot, and over a year to record on this computer program.

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